CHAPTER 9

Common Stock Portfolio Management Strategies

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In this chapter, we review equity portfolio strategies, taking a close look at active and passive management, the decision as to whether or not to pursue an active or passive management, style investing, and the different types of active strategies that can be employed. We begin the chapter with a discussion of the equity portfolio management process.

INTEGRATING THE EQUITY PORTFOLIO MANAGEMENT PROCESS

In Chapter 1, the investment management process was described as a series of five distinct tasks. In practice, portfolio management requires an integrated approach. There must be recognition that superior investment performance results when valuable ideas are implemented in a cost-efficient

EXHIBIT 9.1 The Investing Process

Source: See Wayne H. Wagner and Mark Edwards, "Implementing Investment Strategies: The Art and Science of Investing," Chapter 11 in Frank J. Fabozzi (ed.), *Active Equity Portfolio Management* (Hoboken, NJ: John Wiley & Sons, 1998).

manner. The process of investing—as opposed to the process of investment—includes innovative stock selection and portfolio strategies as well as efficient cost structures for the implementation of any portfolio strategy.[1] Exhibit 9.1 highlights the importance of an integrated approach to managing equity portfolios. It recognizes that the value added by the manager is the result of information value less the implementation cost of trading. This difference in value is referred to as "captured value," a term coined by Wayne Wagner and Mark Edwards.[2]

This view that an investing process requires an integrated approach to portfolio management is reinforced by MSCI BARRA, a vendor of analytical systems used by portfolio managers. This service provider emphasizes that superior investment performance is the product of careful attention paid by equity managers to the following four elements:

- Forming reasonable return expectations.
- Controlling portfolio risk to demonstrate investment prudence.
- Controlling trading costs.
- Monitoring total investment performance.

Accordingly, the investing process that includes these four elements are all equally important in realizing superior investment performance. As for the second element, we will discuss the process of controlling risk in Chapter 13. Trading costs are explained in Chapter 8.

CAPITAL MARKET PRICE EFFICIENCY

Later in this chapter we will explain the two major types of portfolio strategies: active versus passive. The decision as to which of the two approaches

[1]Wayne H. Wagner and Mark Edwards, "Implementing Investment Strategies: The Art and Science of Investing," Chapter 11 in Frank J. Fabozzi (ed.), *Active Equity Portfolio Management* (Hoboken, NJ: John Wiley & Sons, 1998).

[2]Wagner and Edwards, "Implementing Investment Strategies: The Art and Science of Investing."

to pursue depends on the price efficiency of the market. A price efficient market is one where security prices at all times fully reflect all available information that is relevant to their valuation. When a market is price efficient, investment strategies pursued to outperform a broad-based stock market index will not consistently produce superior returns after adjusting for risk and transaction costs.

Numerous studies have examined the pricing efficiency of the stock market. While it is not our intent in this chapter to provide a comprehensive review of these studies, we can summarize the basic findings and implications for common stock portfolio management strategies.

Forms of Efficiency

There are three different forms of pricing efficiency: (1) weak form, (2) semi-strong form, and (3) strong form. The distinctions among these forms rests in the relevant information that is believed to be taken into consideration in the price of the security at all times. Weak-form efficiency means that the price of the security reflects the past price and trading history of the security. Semi-strong–form efficiency means that the price of the security fully reflects all public information (which, of course, includes but is not limited to, historical price and trading patterns). Strong-form efficiency exists in a market where the price of a security reflects all information, whether it is publicly available or known only to insiders such as the firm's managers or directors.

The preponderance of empirical evidence supports the claim that the U.S. common stock market is efficient in the weak form. The evidence emerges from numerous sophisticated tests that explore whether or not historical price movements can be used to project future prices in such a way as to produce returns above what one would expect from market movements and the risk class of the security. Such returns are known as *positive abnormal returns*. The implications are that investors who follow a strategy of selecting common stocks solely on the basis of price patterns or trading volume—such investors are referred to as *technical analysts* or *chartists*—should not expect to do better than the market. In fact, they may fare worse because of higher transactions costs associated with frequent buying and selling of stocks.

Evidence on price efficiency in the semi-strong form is mixed. Some studies support the proposition of efficiency when they suggest that investors who select stocks on the basis of fundamental security analysis—which consists of analyzing financial statements, the quality of management, and the economic environment of a company—will not outperform the market. This result is certainly reasonable. There are so many analysts using the same approach, with the same publicly available data, that the price of the

stock remains in line with all the relevant factors that determine value. On the other hand, a sizable number of studies have produced evidence indicating that there have been instances and patterns of pricing inefficiency in the stock market over long periods of time. Economists and financial analysts often label these examples of inefficient pricing as "anomalies" in the market, that is, phenomena that cannot be easily explained by accepted theory.

Empirical tests of strong form pricing efficiency fall into two groups: (1) studies of the performance of professional money managers, and (2) studies of the activities of insiders (individuals who are either company directors, major officers, or major stockholders). Studying the performance of professional money managers to test the strong form of pricing efficiency has been based on the belief that professional managers have access to better information than the general public. Whether or not this is true is moot because the empirical evidence suggests professional managers have been unable to outperform the market consistently. In contrast, evidence based on the activities of insiders has generally revealed that this group often achieves higher risk-adjusted returns than the stock market. Of course, insiders could not consistently earn those high abnormal returns if the stock prices fully reflected all relevant information about the values of the firms. Thus, the empirical evidence on insiders fails to support the notion that the market is efficient in the strong-form sense.

Implications for Investing in Common Stock

Common stock investment strategies can be classified into two broad categories: active strategies and passive strategies. Active strategies are those that attempt to outperform the market by one or more of the following: (1) timing market transactions, such as in the case of technical analysis, (2) identifying undervalued or overvalued stocks using fundamental security analysis, or (3) selecting stocks according to one of the market anomalies. Obviously, the decision to pursue an active strategy must be based on the belief that there is some type of gain from such costly efforts, but gains are possible only if pricing inefficiencies exist. The particular strategy chosen depends on why the investor believes this is the case.

Investors who believe that the market prices stocks efficiently should accept the implication that attempts to outperform the market cannot be systematically successful, except by luck. This implication does not mean that investors should shun the stock market, but rather that they should pursue a passive strategy, one that does not attempt to outperform the market. Is there an optimal investment strategy for someone who holds this belief in the pricing efficiency of the stock market? Indeed there is. The theoretical basis rests on modern portfolio theory and capital market the-

ory. According to modern portfolio theory, the market portfolio offers the highest level of return per unit of risk in a market that is price efficient. A portfolio of financial assets with characteristics similar to those of a portfolio consisting of the entire market—the market portfolio—will capture the pricing efficiency of the market.

But how can such a passive strategy be implemented? More specifically, what is meant by a market portfolio, and how should that portfolio be constructed? In theory, the market portfolio consists of all financial assets, not just common stock. The reason is that investors compare all investment opportunities, not just stock, when committing their capital. Thus, our principles of investing must be based on capital market theory, not just stock market theory. When the theory is applied to the stock market, the market portfolio has been interpreted as consisting of a large universe of common stocks. But how much of each common stock should be purchased when constructing the market portfolio? Theory states that the chosen portfolio should be an appropriate fraction of the market portfolio; hence, the weighting of each stock in the market portfolio should be based on its relative market capitalization. Thus, if the aggregate market capitalization of all stocks included in the market portfolio is $\$T$ and the market capitalization (i.e., number of shares times the share price) of one of these stocks is $\$A$, then the fraction of this stock that should be held in the market portfolio is $\$A/\$T$.

The passive strategy that we have just described is called *indexing*. As pension fund sponsors in the 1990s increasingly came to believe that managers were unable to outperform the stock market, the amount of funds managed using an indexing strategy has grown substantially. That being said, the passive indexing approach to investing has been called into question by some plan sponsors due to the flat-to-negative average performance of the stock market in the decade following 2000.

TRACKING ERROR AND RELATED MEASURES

Tracking error is a key concept in understanding the potential performance of a common stock portfolio relative to a benchmark index, as well as the actual performance of a common stock portfolio relative to a benchmark index. Tracking error can be used to measure the degree of active management by a portfolio manager.

Definition of Tracking Error

As explained in Chapter 3, a portfolio's risk can be measured by the standard deviation of portfolio returns. This statistical measure provides a range around the portfolio's average return within which the actual return over a

period is likely to fall with some specific probability. The mean return and standard deviation (or volatility) of a portfolio can be calculated over a period of time.

The standard deviation or volatility of a portfolio or a market index is an absolute number. A portfolio manager or client can also ask what the variation of the portfolio's return is relative to a specified benchmark. Such variation is called the portfolio's *tracking error*.

Specifically, tracking error measures the dispersion of a portfolio's returns relative to the benchmark's returns. That is, tracking error is the standard deviation of the portfolio's *active return* where active return is defined as:

Active return = Portfolio's actual return – Benchmark's actual return

A portfolio created to match the benchmark (i.e., an index fund) that regularly has zero active returns (that is, always matches its benchmark's actual return) would have a tracking error of zero. But a portfolio that is actively managed that takes positions substantially different from the benchmark would likely have large active returns, both positive and negative, and thus would have an annual tracking error of, say, 5% to 10%.

To find the tracking error of a portfolio, it is first necessary to specify the benchmark. The tracking error of a portfolio, as indicated, is its standard deviation relative to the benchmark, *not* its total standard deviation. For example, an index fund that exactly matches the S&P 500 would have a tracking error of 0% but is likely to have an overall standard deviation that is different from zero, which is the standard deviation of its benchmark. Exhibit 9.2 presents the information used to calculate the tracking error for a hypothetical portfolio and benchmark using 30 weekly observations. The fourth column in the exhibit shows the active return for the week. It is from the data in this column that the tracking error is computed. As reported in the exhibit, the standard deviation of the weekly active returns is 0.54%. This value is then annualized by multiplying by the square root of 52—52 representing the number of weeks in a year.[3] This gives a value of 3.89%.

Given the tracking error, a range for the possible portfolio active return and corresponding range for the portfolio can be estimated assuming that the active returns are normally distributed. For example, assume the following:

Benchmark = S&P 500
Expected return on S&P 500 = 20%
Tracking error relative to S&P 500 = 2%

[3]If the observations were monthly rather than weekly, the monthly tracking error would be annualized by multiplying by the square root of 12.

EXHIBIT 9.2 Data and Calculation for Active Return, Alpha, and Information Ratio

	Weekly Returns (%)		
Week	Portfolio	Benchmark	Active
1	3.69%	3.72%	–0.03%
2	–0.56	–1.09	0.53
3	–1.41	–1.35	–0.06
4	0.96	0.34	0.62
5	–4.07	–4.00	–0.07
6	1.27	0.91	0.36
7	–0.39	–0.08	–0.31
8	–3.31	–2.76	–0.55
9	2.19	2.11	0.08
10	–0.02	–0.40	0.38
11	–0.46	–0.42	–0.04
12	0.09	0.71	–0.62
13	–1.93	–1.99	0.06
14	–1.91	–2.37	0.46
15	1.89	1.98	–0.09
16	–3.75	–4.33	0.58
17	–3.38	–4.22	0.84
18	0.60	0.62	–0.02
19	–10.81	–11.60	0.79
20	6.63	7.78	–1.15
21	3.52	2.92	0.60
22	1.24	1.89	–0.66
23	–0.63	–1.66	1.03
24	3.04	2.90	0.14
25	–1.73	–1.58	–0.15
26	2.81	3.05	–0.24
27	0.40	1.64	–1.24
28	1.03	1.03	0.00
29	–0.94	–0.95	0.01
30	1.45	1.66	–0.21

Average of active returns = 0.035%
Standard deviation of active returns = 0.54%

Annualizing
Annual average = Weekly average × 52
Annual std dev = Weekly std dev × $(52^{0.5})$

Hence, on an annual basis,
alpha = 1.82% (= 0.035% × 52 = annualized average of weekly active returns)
tracking error = 3.89% (= 0.54% × $[52^{0.5}]$ = annualized std dev of weekly active returns)
information ratio = alpha/tracking error = 1.82%/3.89%= 0.47

then[4]

Number of Standard Deviations	Range for Portfolio Active Return	Corresponding Range for Portfolio Return	Probability
1	±2%	18%–22%	67%
2	±4%	16%–24%	95%
3	±6%	14%–26%	99%

A manager can pursue a blend of an active and passive (i.e., indexing) strategy. That is, a manager can construct a portfolio such that a certain percentage of the portfolio is indexed to some benchmark and the balance actively managed. Assume that the passively managed portion (i.e., the indexed portion) has a zero tracking error relative to the benchmark. For such a strategy, we can show (after some algebraic manipulation) that the tracking error for the overall portfolio would be as follows:

Portfolio tracking error relative to index
= (Percent of portfolio actively managed)
× (Tracking error of the actively managed portion relative to index)

An *enhanced index fund* differs from an index fund in that it deviates from the index holdings in small amounts and hopes to slightly outperform the index through those small deviations. In terms of an active/passive strategy, the manager allocates a small percentage of the portfolio to be actively managed. The reason is that in case the bets prove detrimental, then the underperformance would be small. Thus, realized returns would always deviate from index returns only by small amounts. There are many enhancing strategies. Suppose that a manager whose benchmark is the S&P 500 pursues an enhanced indexing strategy allocating only 5% of the portfolio to be actively managed and 95% indexed. Assume further that the tracking error of the actively managed portion is 15% with respect to the S&P 500. The portfolio would then have a tracking error calculated as follows:

Percent of portfolio actively managed relative to S&P 500 = 5%
Tracking error relative to S&P 500 = 15%
Portfolio's tracking error relative to S&P 500 = 5% × 15% = 0.75%

Forward-Looking Versus Backward-Looking Tracking Error

In Exhibit 9.1 the tracking error of the hypothetical portfolio is shown based on the active returns reported. However, the performance shown is the re-

[4]The probabilities are based on a normal probability distribution.

sult of the portfolio manager's decisions during those 30 weeks with respect to portfolio positioning issues such as beta, sector allocations, style tilt (i.e., value versus growth), stock selections, etc. Hence, we can call the tracking error calculated from these trailing active returns a *backward-looking tracking error*. It is also called an *ex-post tracking error*.

One problem with a backward-looking tracking error is that it does not reflect the effect of current decisions by the portfolio manager on the future active returns and hence the future tracking error that may be realized. If, for example, the manager significantly changes the portfolio beta or sector allocations today, then the backward-looking tracking error that is calculated using data from prior periods would not accurately reflect the current portfolio risks going forward. That is, the backward-looking tracking error will have little predictive value and can be misleading regarding portfolio risks going forward.

The portfolio manager needs a forward-looking estimate of tracking error to accurately reflect the portfolio's risk going forward. The way this is done in practice is by using the services of a commercial vendor that has a model, called a multifactor risk model, that has defined the risks associated with a benchmark. Such a model is described in Chapter 13. Statistical analysis of the historical return data of the stocks in the benchmark are used to obtain the factors and quantify their risks. (This involves the use of variances and correlations.) Using the manager's current portfolio holdings, the portfolio's current exposure to the various factors can be calculated and compared to the benchmark's exposures to the same factors. Using the differential factor exposures and the risks of the factors, a portfolio's *forward-looking tracking error* can be computed. This tracking error is also referred to as the *predicted tracking error* or *ex ante tracking error*.

There is no guarantee that the forward-looking tracking error at the start of, say, a year would exactly match the backward-looking tracking error calculated at the end of the same year. There are two reasons for this. The first is that as the year progresses and changes are made to the portfolio, the forward-looking tracking error estimate would change to reflect the new exposures. The second is that the accuracy of the forward-looking tracking error depends on the extent of the stability in the variances and correlations that were used in the analysis. These problems notwithstanding, the average of forward-looking tracking error estimates obtained at different times during the year will be reasonably close to the backward-looking tracking error estimate obtained at the end of the year.

Each of these estimates has its use. The forward-looking tracking error is useful in risk control and portfolio construction. The manager can immediately see the likely effect on tracking error of any planned change in the portfolio. Thus, a portfolio manager can do a what-if analysis of various

portfolio strategies and eliminate those that would result in a tracking error that exceeds a specified risk tolerance. The backward-looking tracking error can be useful for assessing actual performance analysis, such as the information ratio discussed next.

Information Ratio

Alpha is the average active return over a time period. Since backward-looking tracking error measures the standard deviation of a portfolio's active return, it is different from alpha. A portfolio does not have backward-looking tracking error simply because of outperformance or underperformance. For instance, consider a portfolio that outperforms (or underperforms) its benchmark by exactly 10 basis points every month. This portfolio would have a backward-looking tracking error of zero and a positive (negative) alpha of 10 basis points. In contrast, consider a portfolio that outperforms its benchmark by 10 basis points during half the months and underperforms by 10 bp during the other months. This portfolio would have a backward-looking tracking error that is positive but an alpha equal to zero.[5]

The *information ratio* combines alpha and tracking error as follows:

$$\text{Information ratio} = \frac{\text{Alpha}}{\text{Backward-looking tracking error}}$$

The information ratio is essentially a reward-to-risk ratio. The reward is the *average* of the active return, that is, alpha. The risk is the standard deviation of the active return, the tracking error, and, more specifically, backward-looking tracking error. The higher the information ratio, the better the manager performed relative to the risk assumed.

To illustrate the calculation of the information ratio, consider the active returns for the hypothetical portfolio shown in Exhibit 9.2. The weekly average active return is 0.035%. Annualizing the weekly average active return by multiplying by 52 gives an alpha of 1.82%. Since the backward tracking error is 3.89%, the information ratio is 0.47 (1.83%/3.89%)

Marginal Contribution to Tracking Error

Since tracking error arises from various bets (some intentional and some unintentional) placed by the manager through overweights and underweights

[5]Note that in some texts, alpha and tracking error are calculated respectively as the average and the standard deviation of the beta-adjusted active return, instead of the total active return.

relative to the benchmark, it would be useful to understand how sensitive the tracking error is to small changes in each of these bets.

Suppose, for example, a portfolio initially has an overweight of 3% in the semiconductor industry relative to its benchmark, and that the tracking error is 6%. Suppose that the tracking error subsequently increases to 6.1% due to the semiconductor industry weight in the portfolio increasing by 1% (and hence the overweight increases to 4%). Then, it can be said that this industry adds 0.1% to tracking error for every 1% increase in its weight. That is, its *marginal contribution to tracking error* is 0.1%. This would hold only at the margin, i.e., for a small change, and not for large changes.

Marginal contributions can be also calculated for individual stocks. If the risk analysis employs a multifactor risk model, then similar marginal contribution estimates can be obtained for the risk factors also.

Generally, marginal contributions would be positive for overweighted industries (or stocks) and negative for underweighted ones. The reason is as follows. If a portfolio already holds an excess weight in an industry, then increasing this weight would cause the portfolio to diverge further from the benchmark. This increased divergence adds to tracking error, leading to a positive marginal contribution for this industry. Suppose, however, the portfolio has an underweight in an industry. Then, increasing the portfolio weight in this industry would make the portfolio converge towards the benchmark, thus reducing tracking error. This leads to a negative marginal contribution for this industry.

An analysis of the marginal contributions can be useful for a manager who seeks to alter the portfolio's tracking error. Suppose a manager wishes to reduce the tracking error, then portfolio overweights in industries (or stocks) with the highest positive marginal contributions should be reduced. Alternatively, a manager can reduce the underweights (i.e., increase the overall weights) in industries (or stocks) with the most negative marginal contributions. Such changes would be most effective in reducing the tracking error while minimizing the necessary turnover and the associated expenses.

ACTIVE VERSUS PASSIVE PORTFOLIO MANAGEMENT

While earlier in this chapter we distinguished between the extremes of equity portfolio management—passive versus active—in practice there are investors who pursue different degrees of active management and different degrees of passive management. It would be helpful to have some way of quantifying the degree of active or passive management. Fortunately, there is a way to do that.

EXHIBIT 9.3 Measures of Management Categories

	Indexing	Active Management	Enhanced Indexing
Expected Alpha	0%	2.0% or higher	0.5% to 2.0%
Tracking Error	0% to 0.2%	4% or higher	0.5% to 2.0%

Source: Exhibit 2 in John S. Loftus, "Enhanced Equity Indexing," Chapter 4 in Frank J. Fabozzi (ed.), *Perspectives on Equity Indexing* (Hoboken, NJ: John Wiley & Sons, 2000), p. 84.

John Loftus has suggested that one way of classifying the various types of equity strategies is in terms of alpha and tracking error.[6] Based on these measures, Loftus proposes the classification scheme shown in Exhibit 9.3. While there may be disagreements as to the values proposed by Loftus, the exhibit does provide some guidance. In an indexing strategy, the portfolio manager seeks to construct a portfolio that matches the risk profile of the benchmark, the expected alpha is zero and, except for transaction costs and other technical issues discussed later when we cover the topic of indexing, the tracking error should be, in theory, zero. Due to these other issues, tracking error will be a small positive value. At the other extreme, a manager who pursues an active strategy by constructing a portfolio that significantly differs from the risk profile of the benchmark has an expected alpha of more than 2% and a large tracking error—a tracking error of 4% or higher.

Using tracking error as our guide and the fact that a manager can construct a portfolio whose risk profile can differ to any degree from the risk profile of the benchmark, we have a conceptual framework for understanding common stock portfolio management strategies. For example, there are managers that will construct a portfolio with a risk profile close to that of the benchmark but intentionally not identical to it. Such a strategy as we mentioned earlier is enhanced indexing. This strategy will result in the construction of a portfolio that has greater tracking error relative to an indexing strategy. In the classification scheme proposed by Loftus, for an enhanced indexer the expected alpha does not exceed 2% and the tracking error is 0.5% to 2%.

EQUITY STYLE MANAGEMENT

Before we discuss the various types of active and passive strategies, let's discuss an important topic regarding what has come to be known as *equity investment styles*. Several academic studies found that there were categories

[6]John S. Loftus, "Enhanced Equity Indexing," Chapter 4 in Frank J. Fabozzi (ed.), *Perspectives on Equity Indexing* (Hoboken, NJ: John Wiley & Sons, 2000).

of stocks that had similar characteristics and performance patterns. Moreover, the returns of these stock categories performed differently than other categories of stocks. That is, the returns of stocks within a category were highly correlated and the returns between categories of stocks were relatively uncorrelated. As a result of these studies, practitioners began to view these categories of stocks with similar performance as a "style" of investing. Using size as a basis for categorizing style, some managers became "large cap" investors while others "small cap" investors. ("Cap" means market capitalization.) Moreover, there was a commonly held belief that a manager could shift "styles" to enhance performance return. Today, the notion of an equity investment style is widely accepted in the investment community. There are three major services that provide popular style indexes.

Types of Equity Styles

Stocks can be classified by style in many ways. The most common is in terms of one or more measures of "growth" and "value." Within a growth and value style there is often a sub-style based on some measure of size. The motivation for the value/growth style categories can be explained in terms of the most common measure for classifying stocks as growth or value—the price-to-book value per share (P/B) ratio.[7] Earnings growth will increase the book value per share. Assuming no change in the P/B ratio, a stock's price will increase if earnings grow—as higher book value times a constant P/B ratio leads to higher stock price. A manager who is growth oriented is concerned with earnings growth and seeks those stocks from a universe of stocks that have higher relative earnings growth. The growth manager's risks are that growth in earnings will not materialize and/or that the P/B ratio will decline.

For a value manager, concern is with the price component rather than with the future earnings growth. Stocks would be classified as value stocks within a universe of stocks if they are viewed as cheap in terms of their P/B ratio. By cheap it is meant that the P/B ratio is low relative to the universe of stocks. The expectation of the manager who follows a value style is that the P/B ratio will return to some normal level and thus even with book value per share constant, the price will rise. The risk is that the P/B ratio will not increase.

Within the value and growth categories there are sub-styles. In the value category, there are three sub-styles: low price-to-earnings (P/E) ratio, con-

[7]Support for the use of this measure is provided in Eugene F. Fama and Kenneth R. French, "Common Risk Factors on Stocks and Bonds," *Journal of Financial Economics* (February 1993), pp. 3–56.

trarian, and yield.[8] The *low-P/E manager* concentrates on companies trading at low prices relative to their P/E ratio.[9] (The P/E ratio can be defined as the current P/E, a normalized P/E, or a discounted future earnings.) The *contrarian manager* looks at the book value of a company and focuses on those companies that are selling at low valuation relative to book value. The companies that fall into this category are typically depressed cyclical stocks or companies that have little or no current earnings or dividend yields. The expectation is that the stock is on a cyclical rebound or that the company's earnings will turn around. Both these occurrences are expected to lead to substantial price appreciation. The most conservative value managers are those that look at companies with above average dividend yields that are expected to be capable of increasing, or at least maintaining, those yields. This style is followed by a manager who is referred to as a *yield manager*.

Growth managers seek companies with above average growth prospects. In the growth manager style category, there tends to be two major sub-styles.[10] The first is a growth manager who focuses on high-quality companies with consistent growth. A manager who follows this sub-style is referred to as a *consistent growth manager*. The second growth sub-style is followed by an *earnings momentum growth manager*. In contrast to a consistent growth manager, an earnings momentum growth manager prefers companies with more volatile, above-average growth. Such a manager seeks to buy companies in expectation of an acceleration of earnings.

There are some managers who follow both a growth and value investing style but have a bias (or tilt) in favor of one of the styles. The bias is not sufficiently identifiable to categorize the manager as either a growth or value manager. Most managers who fall into this hybrid style are described as *growth at a price managers* or *growth at a reasonable price managers*. These managers look for companies that are forecasted to have above-average growth potential selling at a reasonable value.

Range of Equity Style Opportunities

There are different equity styles used by managers of mutual funds. There are organizations that classify managers based on several broad style clas-

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[8]Jon A. Christopherson and C. Nola Williams, "Equity Style: What It Is and Why It Matters," Chapter 1 in T. Daniel Coggin, Frank J. Fabozzi, and Robert D. Arnott (eds.), *The Handbook of Equity Style Management: Second Edition* (Hoboken, NJ: John Wiley & Sons, 1997).

[9]For a discussion of an approach based on low price-earnings, see Gary G. Schlarbaum, "Value-Based Equity Strategies," Chapter 7 in *The Handbook of Equity Style Management*.

[10]Christopherson and Williams, "Equity Style: What It Is and Why It Matters."

sifications. One of these organizations is Morningstar which introduced the Morningstar Style Box™ in 1992. Morningstar classifies equity mutual funds on the basis of size—in terms of market capitalization of the stocks held—and style—value versus growth. Based on size and style, Morningstar classifies mutual funds according to the following 3 × 3 (or nine-box) matrix range of equity styles:

	Value	**Blend**	**Growth**
Large Cap	Lge V	Lge B	Lge G
Mid Cap	Mid V	Mid B	Mid G
Small Cap	Sm V	Sm B	Sm G

Morningstar believes that combining these two variables offers investors a broad view of a mutual fund's holdings and risk. The actual size measure used by Morningstar for an equity fund is based on the geometric mean of the market capitalizations of the stocks in the fund. For example, if a mutual fund held equal proportions in three large cap stocks with market capitalizations of $15 billion, $20 billion, and $25 billion, respectively, then the Morningstar size measure for the equity fund would be:

$$\text{Size} = \$15^{1/3} \times \$20^{1/3} \times \$25^{1/3} = \$19.57 \text{ billion}$$

For reporting, the size value of the mutual fund would be shown by Morningstar as the average market capitalization of the stocks in the fund. In turn, Morningstar uses composite scores based on five value and five growth variables to distinguish the value and growth orientation of the stocks in the fund. The Morningstar growth score for a stock is based on an evaluation of both long-term projected earnings growth, at 50% weight, and historical growth measures, with a 12.5% weighting on sales growth, earnings growth, cash flow growth and book growth, respectively. Growth stocks score high on these growth rate measures. While we indicated earlier that the value style of a fund is often related to the P/B ratio, the Morningstar value orientation of a stock in a fund is based on an assessment of the forward-looking P/E, at 50% weight, and historical price multiples, with a 12.5% weighting on P/B, P/S, P/CF, and dividend yield, respectively. Based on these price relatives, value stocks generally have low price multiples and high dividend yields (to the extent that a stock pays dividends). Stocks that do not exhibit either a value or growth orientation would fall into the Morningstar core or blend style.

The Morningstar value and growth orientation for equity mutual funds are consistent across U.S. and non-U.S. markets, as the style of each fund

is determined relative to the appropriate regional (or country) index. The regions of the world covered by Morningstar in their mutual fund reporting include the United States, Canada, Europe, Japan, Asia ex-Japan, Australia/New Zealand, and Latin America. In the case of U.S. domestic stocks, size is a measure of the average market cap of a mutual fund's holdings as it compares to the average market cap of stocks in the Morningstar equity database of the 5,000 largest domestic stocks.

Depending on size (market capitalization), Morningstar places a mutual fund into a large-cap, mid-cap, or small-cap grouping. As noted, the style orientation of a stock in a fund is based on a composite of fundamentals including price multiples for value stocks and growth rates for growth stocks. An average of these scores is computed for each of the size categories. The average style score of a mutual fund's holdings is then compared to the average for its size category. Mutual funds whose average style scores are well above the average are categorized as "growth," and those with scores that are well below the average are categorized as "value." This style classification system is supported (although not necessarily) by the observation that growth stocks (i.e., stocks with higher than average earnings growth rates) have high P/E and P/B ratios, while value stocks have low P/E and P/B ratios.

In terms of size definitions, conventional wisdom holds that large cap stocks have an average market capitalization of more than $5 billion. Mid cap stocks often range from $1 to $5 billion on the size scale, while small caps have an equity capitalization of less than $1 billion. The following 5 × 3 (or 15-box) matrix range includes giant cap funds and expands the range of opportunities for classifying equity mutual funds by size and style:

	Value	**Blend**	**Growth**
Giant Cap	*Giant V*	*Giant B*	*Giant G*
Large Cap	Lge V	Lge B	Lge G
Mid Cap	Mid V	Mid B	Mid G
Small Cap	Sm V	Sm B	Sm G
Micro Cap	*Mic V*	*Mic B*	*Mic G*

In the 5 × 3 equity style matrix, giant-cap value- and giant-cap growth funds have been added to the traditional 3 × 3 style matrix to recognize that another equity size classification is needed—namely "giant cap" or maxi-cap stocks—as many U.S. large capitalization firms have market values well in excess of $100 billion. Moreover, in terms of the possible creation of style active or passive (indexing) opportunities, it is noteworthy that at the low-

est end of the equity size spectrum, *micro*-cap stocks have an equity cap of about $250 million, or less.

For consistency across U.S. and non-U.S. markets, Morningstar uses the following size convention for classifying giant cap, large cap, mid cap, small cap, and micro cap funds. Again, fund size is reported by Morningstar as the average market capitalization of component stocks in a mutual fund.

Giant cap = highest 40% of total market capitalization
Large cap = next 30% of total market capitalization
Mid cap = next 20% of total market capitalization
Small cap = next 7% of total market capitalization
Micro cap = remaining 3% of total market capitalization

Moreover, the determination of the value and growth styles for mutual funds comprising the 5 × 3 equity style matrix is the same as that outlined before. In addition to the 3 × 3 style box for equity mutual funds, Morningstar conducts investment style analysis on fixed income funds, balanced funds, exchange-traded funds, and hedge funds, among other investment fund vehicles. In recent years, Morningstar has developed the dual concepts of the fund centroid and the Ownership Zone[SM]. In simple terms, the fund centroid reflects the asset-weighted average of the funds' holdings, while the Ownership Zone reflects the possible range of styles across the equity style box that includes 75% of a fund's holdings. While caveats apply, particularly for active equity managers, the concepts of the fund centroid and the Ownership Zone can be used by investors to assess the location and consistency of a particular style, whether value, growth, or blend orientation within the equity style box.

PASSIVE STRATEGIES

There are two types of passive strategies: a buy-and-hold strategy and an indexing strategy. In a *buy-and-hold strategy*, a portfolio of stocks based on some criterion is purchased and held to the end of some investment horizon. There is no active buying and selling of stocks once the portfolio is created. While referred to as a passive strategy, there are elements of active management. Specifically, the investor who pursues this strategy must determine which stock issues to buy.

An indexing strategy is the more commonly followed passive strategy. With this strategy, the manager does not attempt to identify undervalued or overvalued stock issues based on fundamental security analysis. Nor does the manager attempt to forecast general movements in the stock market

and then structure the portfolio so as to take advantage of those movements. Instead, an indexing strategy involves designing a portfolio to track the total return performance of a benchmark index. Next we explain how that is done.

Constructing an Indexed Portfolio

In constructing a portfolio to replicate the performance of the benchmark index, sometimes referred to as the *indexed portfolio* or the *tracking portfolio*, there are several approaches that can be used. One approach is to purchase all stock issues included in the benchmark index in proportion to their weightings. A second approach, referred to as the *capitalization approach*, is one in which the manager purchases a number of the largest capitalized names in the benchmark index and equally distributes the residual stock weighting across the other issues in the benchmark index. For example, if the top 150 highest-capitalization stock issues are selected for the replicating portfolio and these issues account for 70% of the total capitalization of the benchmark index, the remaining 30% is evenly proportioned among the other stock issues.

Another approach is to construct an indexed portfolio with fewer stock issues than the benchmark index. Two methods used to implement this approach are the cellular (or stratified sampling) method and the multifactor risk model method.

In the *cellular method*, the manager begins by defining risk factors by which the stocks that make up a benchmark index can be categorized. A typical risk factor is the industry in which a company operates. Other factors might include risk characteristics such as beta or capitalization. The use of two characteristics would add a second dimension to the stratification. In the case of the industry categorization, each company in the benchmark index is assigned to an industry. This means that the companies in the benchmark have been stratified by industry. The objective of this method is then to reduce residual risk by diversifying across all industries in the same proportion as the benchmark index. Stock issues within each cell or stratum, or in this case industry, can then be selected randomly or by some other criterion such as capitalization ranking.

The second method is using a multifactor risk model to construct a portfolio that matches the risk profile of the benchmark index as explained in Chapter 13. By doing so, a predicted tracking error close to zero can be obtained. In the case of smaller portfolios, this approach is ideal since the manager can assess the tradeoff of including more stock issues versus the

higher transaction costs for constructing the indexed portfolio. This can be measured in terms of the effect on predicted tracking error.

ACTIVE INVESTING

In contrast with passive investing, active investing makes sense when a moderate to low degree of capital market efficiency is present in the financial markets (or areas thereof). This happens when the active investor has (1) better information than most other investors (namely, the "consensus" investors), and/or (2) the investor has a more productive way of looking at a given information set to generate active rewards.

In general, active strategies can be classified as following either a top-down approach or a bottom-up approach. We discuss each approach below.

Top-Down Approaches to Active Investing

Before delving into the "top-down" approach to investing, it should be noted that those who actually use portfolio analysis to select portfolios do so in one of two major ways: top-down approach and all-at-once approach.

In the top-down approach, a "top-down" portfolio analysis is performed at the asset class level. Then, the asset class allocation is implemented either passively or actively. If implemented actively, this can be done quantitatively or informally. If done quantitatively, then the asset class index becomes the benchmark for the manager with this mandate. In this approach to portfolio analysis, expected returns for asset classes can be based on macroeconomic models or other considerations. This was demonstrated in Chapter 3 where we discussed Markowitz portfolio selection. In the "all-at-once" approach to portfolio analysis, means, variances, and covariances are supplied at the individual stock level and an efficient frontier is computed at the security level rather than at the asset class level.

With this background, we can now distinguish between two types of top-down active investing. Namely (1) top-down active investing that involves the utilization and forecasts of key variables that impact the macroeconomic outlook (such as consumer confidence, commodity prices, interest rates, inflation, and economic productivity), and (2) top-down active investing by equity management styles such as value or growth. We'll look at the macroeconomic outlook approach to top-down active investing with recognition that active investing (or tilting) by equity styles such as value or growth is to some degree a byproduct of the former approach to top-down active investing.

Macroeconomic Approach to Top-Down Investing

With the macroeconomic variables approach to top-down active investing, an equity manager[11] begins by assessing the macroeconomic environment and forecasting its near-term outlook. Based on this assessment and forecast, an equity manager decides on how much of the portfolio's funds to allocate among the different sectors of the equity market and how much to cash equivalents (i.e., short-term money market instruments).

Given the amount of the portfolio's funds to be allocated to the equity market, the manager must then decide how much to allocate among the sectors and industries of the equity market. The sectors of the equity market can be classified as follows: basic materials, communications, consumer staples, financials, technology, utilities, capital goods, consumer cyclical, energy, health care, and transportation.[12] Industry classifications give a finer breakdown and include, for example, aluminum, paper, international oil, beverages, electric utilities, telephone and telegraph, and so forth.

In making the active asset allocation decision, a manager who follows a macroeconomic approach to top-down investing often relies on an analysis of the equity market to identify those sectors and industries that will benefit the most on a relative basis from the anticipated economic forecast. Once the amount to be allocated to each sector and industry is made, the manager then looks for the individual stocks to include in the portfolio. The top-down approach looks at changes in several macroeconomic factors to assess the expected active return on securities and portfolios. As noted before, prominent economic variables include changes in commodity prices, interest rates, inflation, and economic productivity.

Additionally, the macroeconomic outlook approach to top-down investing can be both quantitative and qualitative in nature. From the former perspective, equity managers employ factor models in their top-down attempt at generating abnormal returns (that is, positive alpha).

The power of top-down factor models is that given the macroeconomic risk measures and factor sensitivities, a portfolio's risk exposure profile can be quantified and controlled. In this way, it is possible to see why a portfolio is likely to generate abnormally high or low returns in the marketplace. However, one of the practical limitations of these quantitatively based approaches to equity management is that there can be considerable disagreement about the right number of macro-risk pricing factors.

[11]In the discussion that follows, we take an institutional perspective where the active portion of the client's portfolio (pension fund, endowment, etc.) is managed by a professional money manager.

[12]These are the categories used by Standard & Poor's Corporation. There is another sector labeled "miscellaneous" that includes stocks that do not fall into any of the other sectors.

Style Active Approach to Top-Down Investing

Tilting or rotating by equity style—such as value or growth—is another form of top-down active investing. In this context, the enhanced equity style matrix presented earlier in this chapter has several active management implications. For example, if abnormal return opportunities exist in the giant cap or maxi-cap universe—due perhaps to leftover corporate restructurings and or acquisitions—then investors could tilt their portfolios in the relevant "giant cap" value or growth direction. Also, if untapped opportunities exist way down in "micro-cap land," then active equity allocations can be tilted toward micro-cap stocks having a value or growth orientation.

From a style-active perspective, it is interesting to note that several studies document the risk-adjusted return superiority of a value style of investing over a growth style. While the empirical evidence seems compelling regarding the performance superiority of a value style of investing, the findings are problematic in several respects. First, the empirical findings contradict the long-established view in finance that investors should be compensated for bearing market or systematic risk. Second, according to one study,[13] there is ample reason to believe that equity styles per se—such as value, growth, and small cap—reflect both macroeconomic and monetary influences. Third, the findings on value versus growth investing imply that active value managers may be penalized over active growth managers for their low-risk investment successes because their equity style benchmarks—due to unexplained empirical regularities—have comparatively high expected returns.[14]

Bottom-Up Approaches to Active Investing

The "bottom-up" approach to active investing makes sense when numerous pricing inefficiencies exist in the capital markets (or components thereof). An investor who follows a bottom-up approach to investing focuses either

[13]See, Gerald R. Jensen, Robert R. Johnson, and Jeffrey M. Mercer, "The Inconsistency of Small-Firm and Value Stock Premiums," *Journal of Portfolio Management* (Winter 1998), pp. 27–36.

[14]One study supports the view that it may be easier for growth managers to outperform their equity-style benchmarks, while value managers have an added measure of return responsibility. See T. Daniel Coggin and Charles Trzcinka, "Analyzing the Performance of Equity Managers: A Note on Value versus Growth," in *The Handbook of Equity Style Management*, pp. 167–170. Coggin, Fabozzi, and Rahman find that institutional equity managers not only outperformed the stock market in general, but that their active performance measures (alpha) for benchmarked-growth portfolios were higher than the corresponding security-selection measures for value-focused managers. See, T. Daniel Coggin, Frank J. Fabozzi, and Shafiqur Rahman, "The Investment Performance of U.S. Equity Pension Fund Managers: An Empirical Investigation," *Journal of Finance* (July 1993), pp. 1039–1055.

on (1) technical aspects of the market or (2) the economic and financial analysis of individual companies, giving relatively less weight to the significance of economic and market cycles.

The investor who pursues a bottom-up strategy based on certain technical aspects of the market is said to be basing stock selection on technical analysis. The primary research tool used for investing based on economic and financial analysis of companies is called *security analysis*. We will describe security analysis next and technical analysis later.

The following three types of security analysis can now be distinguished in practice:

- Traditional fundamental analysis
- Quantitative fundamental analysis
- Value-based metric analysis

Traditional Fundamental Analysis

Traditional fundamental analysis often begins with the financial statements of a company in order to investigate its revenue, earnings, and cash flow prospects, as well as its overall corporate debt burden. Growth in revenue, earnings, and cash flow on the income statement side (current and proforma) and the relative magnitude of corporate leverage (namely, debt-to-capital ratio among others) from current and anticipated balance sheets are frequently used by fundamental equity analysts in forming an opinion of the investment merits of a particular company's stock.

In this type of security analysis, the investor also looks at the firm's product lines, the economic outlook for the products (including existing and potential competitors), and the industries in which the company operates. Based on the growth prospects of earnings, the fundamental analyst attempts to determine the fair market value (or the "intrinsic value") of the stock, using, for example, a price-to-earnings or price-to-book value multiplier. The estimated "fair value" of the firm is then compared to the actual market price to see if the stock is correctly priced in the capital market. "Cheap stocks," or potential buy opportunities, have a current market price below the estimated intrinsic value, while "expensive" or overvalued stocks have a market price that exceeds the calculated present worth of the stock. Benjamin Graham and David Dodd developed the classical approach to equity securities analysis.[15] Notable investors who have successfully employed the traditional approach to equity security analysis include Warren Buffet of Berkshire Hathaway, Inc. and Peter Lynch of Fidelity Management & Research Co.

[15]See, Benjamin Graham and David Dodd, *Security Analysis* (New York: McGraw-Hill Book Co., Inc.: 1934 original edition).

Quantitative Fundamental Analysis

Quantitative fundamental analysis seeks to assess the value of securities using a statistical model derived from historical information about security returns. The most commonly used model is the *fundamental multifactor risk model* or simply fundamental factor model. One fundamental factor model is the MSCI BARRA model which is described in Chapter 13. Without getting into the statistical details here, this model is both jointly quantitative and fundamental in nature because it has several systematic *non*-market or "common factors" measures that are used in traditional fundamental analysis such as equity size, book-to-price, dividend yield, earnings growth rate, among others, as well as many industry classifications that can be used to identify active rewards on individual securities and portfolios.

Value-Based Metrics Analysis

A rapidly emerging form of security analysis is called the *economic profit* or value-based metrics (VBM) approach to securities analysis. The VBM approach is based on metrics such as EVA® (for Economic Value Added), CFROI® (for Cash Flow Return on Investment), residual income, abnormal earnings, among other names for economic profit measures.[16] While the VBM analysis has been used by corporate managers for many years to measure financial success, Grant and Abate developed the economic profit approach to securities analysis and common stock portfolio management during the mid-1990s to early 2000s.[17] In practice, economic profit measures such as EVA and CFROI fall into the realm of securities analysis be-

[16]There are several value based metrics used in practice including EVA®, CFROI®, residual income, and abnormal earnings. Economic Value Added (EVA®) is a registered trademark of Stern Stewart & Co. For explanation and application of EVA, see G. Bennett Stewart III, *The Quest for Value* (New York: Harper Collins, 1991) and James L. Grant, *Foundations of Economic Value Added* (Hoboken, NJ: John Wiley and Sons, 2003). For explanation of Cash Flow Return on Investment (CFROI®), see Bartley J. Madden, *CFROI® Valuation: A Total Systems Approach to Valuing the Firm* (Woburn, MA: Butterworth-Heinemann, 1999). The analogous VBM concepts of residual income and abnormal earnings are explained respectively in John D. Stowe, Thomas R. Robinson, Jerald E. Pinto, and Dennis W. McLeavey, *Equity Asset Valuation*, CFA Institute Investment Series (Hoboken, NJ: John Wiley & Sons, 2007) and Paul M. Healy and Krishna G. Palepu, *Business Analysis and Valuation: Using Financial Statements* (Mason, Ohio: Southwestern Thomson, 2007).

[17]The foundation on the value-based metrics approach to securities analysis and common stock portfolio management is developed in James L. Grant, "Foundations of EVA for Investment Managers," *Journal of Portfolio Management* (Fall 1996), pp. 41–48, and James A. Abate and Grant, *Focus on Value: A Corporate and Investor Guide to Wealth Creation* (Hoboken, NJ: John Wiley and Sons, 2001).

cause they are related to the firm's underlying net present value (NPV).[18] In this way, the VBM approach is different from traditional accounting measures of profit such as net income and operating earnings (EBITDA or EBIT) because this approach looks at the firm's profitability net of the overall dollar-cost of debt and equity capital. In this context, economic profit is a second bottom line which fully reflects the firm's revenue and operating costs, debt financing cost (interest expense), taxes, and, uniquely, the opportunity cost of equity financing (via the required rate of return on equity measured in dollar terms). In the EVA framework, for example, companies with discounted positive EVA—or equivalently, positive NPV—are viewed as "wealth creators," while firms with discounted negative EVA are viewed as wealth wasters due to the negative NPV outcomes.

In the VBM or EVA approach to securities analysis and common stock portfolio management, wealth creators (i.e., good companies) have the fundamental ability to rationalize capital, while wealth wasters (i.e., the bad- or risky-troubled companies) cannot earn their weighted average cost of capital (WACC) on a consistent basis. In terms of stock selection, Grant and Abate develop an EVA style (or quadrants) approach to show that companies with positive EVA momentum (i.e., the wealth-creating growth and positive restructuring companies) are potential buy opportunities, while the stocks of companies with negative EVA momentum (i.e., the wealth-destroying growth and stagnant companies) are possible sell or short-sell candidates, assuming that market implied expectations of economic profit growth are not fully impounded in share price. This VBM approach to securities analysis and common stock portfolio management—with its central focus on the ability of companies to rationalize capital (return on capital higher or lower than WACC) joined with their capital spending growth rates (positive or negative)—is now known as an "EVA style of investing."

Fundamental Law of Active Management

The information ratio is the ratio of alpha to the tracking error. It is a reward (as measured by alpha) to risk (as measured by tracking error) ratio. The higher the information ratio, the better the performance of the manager. Two portfolio managers, Richard Grinold and Ronald Kahn, have developed a framework—which they refer to as the "fundamental law of active

[18]Indeed, the NPV of any company is equal to the present value of its expected economic profit. This implies that wealth creators have positive average EVA while wealth destroyers have negative average EVA. Given market inefficiencies, Abate and Grant explain that active investors could reap abnormal profits by buying the stocks of companies having positive economic profit momentum and selling or shorting the stocks of companies with discounted negative economic profit happenings.

management"—for explaining how the information ratio changes as a function of:[19]

1. The *depth* of an active manager's skill
2. The *breadth* or number of independent insights or investment opportunities.

In formal terms, the information ratio can be expressed as:

$$IR = IC \times BR^{0.5}$$

IR = the information ratio
IC = the information coefficient
BR = the number of independent insights or opportunities available to the active manager

In the above expression, the information ratio (IR) is the reward-to-risk ratio for an active portfolio manager. (This measure is explained earlier in this chapter.) In turn, the information coefficient (IC) is a measure of the depth of an active manager's skill. On a more formal basis, IC measures the "correlation" between actual returns and those predicted by the portfolio manager. According to the fundamental law of active management, the information ratio also depends on breadth (BR), which reflects the number of creative insights or active investment opportunities available to the investment manager.

There are several interesting implications of the fundamental law of active management. First, we see that the information ratio goes up when manager skill level rises for a given number of independent insights or active opportunities. This fact should be obvious, as a more skillful manager should produce higher risk-adjusted returns, compared with a less skilled manager whose performance is evaluated over the *same* set of investment opportunities (possibly securities). Second, a prolific manager with a large number of independent insights for a given skill level can, in principle, produce a higher information ratio than a manager with the same skill but a limited number of investment opportunities.

Equally important, the fundamental law of active management suggests that a manager with a high skill level but a limited set of opportunities may end up producing the *same* information ratio as a manager having a relatively lower level of skill but more active opportunities. According

[19]Richard Grinold and Ronald Kahn, *Active Portfolio Management* (New York, NY: McGraw Hill Profession, 1999).

to Ronald Kahn,[20] a market timer with an uncanny ability to predict the market may end up earning the same information ratio on the average as a somewhat less skillful stock picker. This might happen because the stock picker has numerous potentially mispriced securities to evaluate, while the otherwise successful market timer may be constrained by the number of realistic market forecasts per year (due, perhaps, to quarterly forecasting or macroeconomic data limitations). Thus, the ability to profitably evaluate an investment opportunity (skill) and the number of independent insights (breadth) is key to successful active management.

With an understanding of the fundamental law of active management, we can now look at the risk of failing to produce a given level of active portfolio return. In this context, Bruce Jacobs and Kenneth Levy suggest that even traditional equity managers face a portfolio management dilemma involving a trade-off between the depth, or "goodness," of their equity management insights and the breadth or scope of their equity management ideas.[21] According to Jacobs and Levy, the breadth of active research conducted by equity managers is constrained in practical terms by the number of investment ideas (or securities) that can be implemented (researched) in a timely and cost efficient manner. This trade-off is shown in Exhibit 9.4.

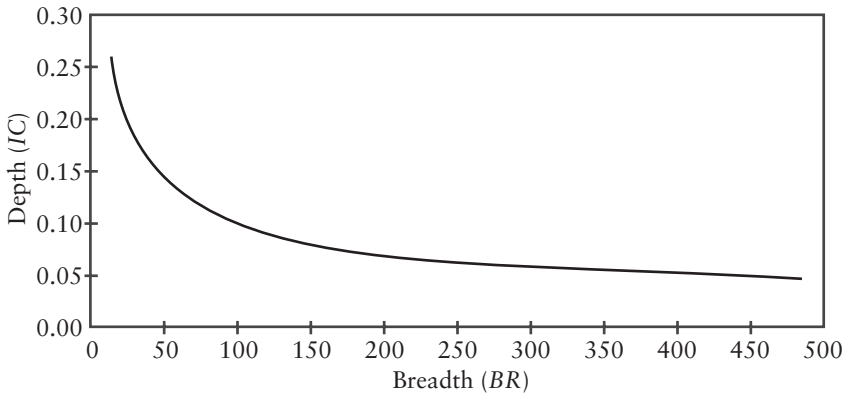
The exhibit displays the relationship between the depth of equity manager insights (vertical axis) and the breadth of those insights (horizontal axis). The depth of equity manager insights is measured in formal terms by the information coefficient (*IC*, on the vertical axis), while the breadth (*BR*) of manager insights can be measured by the potential number of investment ideas or the number of securities in the manager's acceptable universe. When the breadth of equity manager insights is low—as in the case of traditional equity management, according to Jacobs and Levy—then the depth, or "goodness" of each insight needs to be high in order to produce a constant level of active reward-to-active risk (information ratio, *IR*). Exhibit 9.4 shows that this low breadth/high depth combination produces the same level of active reward that would be associated with a pair-wise high number of investable ideas (or securities) and a relatively low level of equity manager "goodness" or depth per insight.

In a risk management context, one can say that the probability of failure to achieve a given level of active reward is quite high when the breadth of investment ideas or securities to be analyzed is very low. If the market is price efficient, that scenario is likely in the traditional fundamental analysis approach to active equity management discussed earlier. On the other

[20]See Ronald N. Kahn, "The Fundamental Law of Active Management," *BARRA Newsletter* (Winter 1997).

[21]Jacobs and Levy, "Investment Management: An Architecture for the Equity Market."

EXHIBIT 9.4 Combination of Breadth (Number) of Insights and Depth, or "Goodness," of Insights Needed to Produce a Given Investment Return/Risk Ratio



Source: See Bruce I. Jacobs and Kenneth N. Levy, "Investment Management: An Architecture for the Equity Market," Chapter 1 in Frank J. Fabozzi (ed.), *Active Equity Portfolio Management* (Hoboken, NJ: John Wiley & Sons, 1998).

hand, the risk of not achieving a given level of active reward is low when the breadth of implementable manager ideas is high. This can happen in a world where active managers employ an engineered approach to active portfolio management. However, if the capital market is largely price efficient, then the probability of failing to produce any level of active reward is high (near one). With market efficiency, investable ideas are transparent, and their active implications are already fully impounded in security prices.

Strategies Based on Technical Analysis

Given the preceding developments, we would be remiss for not shedding some insight on active strategies based on technical analysis. In this context, various common stock strategies that involve only historical price movement, trading volume, and other technical indicators have been suggested since the beginning of stock trading. Many of these strategies involve investigating patterns based on historical trading data (past price data and trading volume) to forecast the future movement of individual stocks or the market as a whole. Based on observed patterns, mechanical trading rules indicating when a stock should be bought, sold, or sold short are developed. Thus, no consideration is given to any factor other than the specified technical indicators. This approach to active management is called *technical analysis*. Because some of these strategies involve the analysis of charts

that plot price and/or volume movements, investors who follow a technical analysis approach are sometimes called *chartists*. The overlying principle of these strategies is to detect changes in the supply of and demand for a stock and capitalize on the expected changes.

Dow Theory

The grandfather of the technical analysis school is Charles Dow. During his tenure as editor of the *Wall Street Journal*, his editorials theorized about the future direction of the stock market. This body of writing is now referred to as the "Dow Theory." This theory rests on two basic assumptions. First, according to Charles Dow, "The averages in their day-to-day fluctuations discount everything known, everything foreseeable, and every condition which can affect the supply of or the demand for corporate securities." This assumption sounds very much like the efficient market theory. But there's more. The second basic assumption is that the stock market moves in trends—up and down—over periods of time. According to Charles Dow, it is possible to identify these stock price trends and predict their future movement.

According to the Dow Theory, there are three types of trends or market cycles. The "primary trend" is the long-term movement in the market. Primary trends are basically four-year trends in the market. From the primary trend a trend line showing where the market is heading can be derived. The secondary trend represents short-run departures of stock prices from the trend line. The third trend is day-to-day fluctuations in stock prices. Charles Dow believed that upward movements in the stock market were tempered by fallbacks that lost a portion of the previous gain. A market turn occurred when the upward movement was not greater than the last gain. In assessing whether or not a gain did in fact occur, he suggested examining the comovements in different stock market indexes such as the Dow Jones Industrial Average and the Dow Jones Transportation Average. One of the averages is selected as the primary index and the other as the "confirming index." If the primary index reaches a high above its previous high, the increase is expected to continue if it is confirmed by the other index also reaching a high above its previous high.

Simple Filter Rules

The simplest type of technical strategy is to buy and sell on the basis of a predetermined movement in the price of a stock; the rule is basically if the stock increases by a certain percentage, the stock is purchased and held until the price declines by a certain percentage, at which time the stock is sold.

The percentage by which the price must change is called the "filter." Each investor pursuing this technical strategy decides his or her own filter.

Moving Averages

Some technical analysts make decisions to buy or sell a stock based on the movement of a stock over an extended period of time (for example, 200 days). An average of the price over the time period is computed, and a rule is specified that if the price is greater than some percentage of the average, the stock should be purchased; if the price is less than some percentage of the average, the stock should be sold. The simplest way to calculate the average is to calculate a simple moving average. Assuming that the time period selected by the technical analyst is 200 days, then the average price over the 200 days is determined. A more complex moving average can be calculated by giving greater weight to more recent prices.

Advance/Decline Line

On each trading day, some stocks will increase in price or "advance" from the closing price on the previous trading day, while other stocks will decrease in price or decline from the closing price on the previous trading day. It has been suggested by some market observers that the cumulative number of advances over a certain number of days minus the cumulative number of declines over the same number of days can be used as an indicator of short-term movements in the stock market.

Relative Strength

The *relative strength* of a stock is measured by the ratio of the stock price to some price index. The ratio indicates the relative movement of the stock to the index. The price index can be the index of the price of stocks in a given industry or a broad-based index of all stocks. If the ratio rises, it is presumed that the stock is in an uptrend relative to the index; if the ratio falls, it is presumed that the stock is in a downtrend relative to the index. Similarly, a relative strength measure can be calculated for an industry group relative to a broad-based index. Relative strength is also referred to as *price momentum* or *price persistence*.

Short Interest Ratio

Some technical analysts believe that the ratio of the number of shares sold short relative to the average daily trading volume is a technical signal that is valuable in forecasting the market. This ratio is called the *short interest*

ratio. However, the economic link between this ratio and stock price movements can be interpreted in two ways. On one hand, some market observers believe that if this ratio is high, this is a signal that the market will advance. The argument is that short sellers will have to eventually cover their short position by buying the stocks they have shorted and, as a result, market prices will increase. On the other hand, there are some market observers who believe this a bearish signal being sent by market participants who have shorted stocks in anticipation of a declining market.

Market Overreaction

To benefit from favorable news or to reduce the adverse effect of unfavorable news, investors must react quickly to new information.[22] According to cognitive psychologists, people tend to overreact to extreme events. People tend to react more strongly to recent information and they tend to heavily discount older information.

The question is, do investors follow the same pattern? That is, do investors overreact to extreme events? The *overreaction hypothesis* suggests that when investors react to unanticipated news that will benefit a company's stock, the price rise will be greater than it should be given that information, resulting in a subsequent decline in the price of the stock. In contrast, the overreaction to unanticipated news that is expected to adversely affect the economic well-being of a company will force the price down too much, followed by a subsequent correction that will increase the price.

If, in fact, the market does overreact, investors may be able to exploit this to realize positive abnormal returns if they can (1) identify an extreme event, and (2) determine when the effect of the overreaction has been impounded in the market price and is ready to reverse. Investors who are capable of doing this will pursue the following strategies. When positive news is identified, investors will buy the stock and sell it before the correction to the overreaction. In the case of negative news, investors will short the stock and then buy it back to cover the short position before the correction to the overreaction.

Nonlinear Dynamic Models: Chaos Theory

Some market observers—like Edgar Peters[23]—believe that the pattern of stock price behavior is so complex that linear (simple, or otherwise) mathematical

[22]Werner DeBondt and Richard Thaler, "Does the Market Overreact?" *Journal of Finance* (July 1985), pp. 793–805.

[23]See, Edgar E. Peters, *Chaos and Order in the Capital Markets: A New View of Cycles, Prices, and Market Volatility* (New York: John Wiley & Sons, 1991).

models are insufficient for detecting historical price patterns and developing models for forecasting future return volatility. While stock prices may appear to change randomly, there could be an undiscovered *nonlinear* pattern that is missed when using simple mathematical tools. Scientists have developed complex mathematical models for detecting patterns from observations of some phenomenon that appear to be random. Generically, these models are called *nonlinear dynamic models* because the mathematics used to detect any structure or pattern is based on a system of nonlinear equations.

Nonlinear dynamic models have been suggested for analyzing stock price patterns. In recent years, there have been several studies that suggest that stock prices exhibit the characteristics of a nonlinear dynamic model.[24] The particular form of nonlinear dynamic models that has been suggested is chaos theory. At this stage, the major insight provided by *chaos theory* is that stock price movements that appear to be random may in fact have a structure that can be used to generate abnormal returns. However, some market observers caution that the actual application of nonlinear return models falls short of the mark.

Strategies Based on Fundamental Analysis

As explained earlier, fundamental analysis involves an economic analysis of a firm with respect to earnings growth prospects, ability to meet debt obligations, competitive environment, and the like.

Proponents of semistrong market efficiency argue that strategies based on fundamental analysis will not produce abnormal returns in the long run. Semistrong-form efficiency means that the price of the security fully reflects all public information (which, of course, includes but is not limited to, historical price and trading patterns).[25] The reason is simply that there are many independent analysts undertaking basically the same sort of analysis, with the same publicly available data, so that the price of the stock reflects all the relevant factors that determine value.

A fundamental tenet of finance theory is that there is a relationship between risk and return. Risk itself cannot be eliminated. If there were no risk, finance theory would be reduced to accounting. Abnormal returns always have to be compared to the inherent risk. One cannot simply say that a given level of return is abnormal unless the relative amount of risk is given.

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[24]See, José Scheinkman and Blake LeBaron, "Nonlinear Dynamics and Stock Returns," *Journal of Business* (1989), pp. 311–337, and Peters, *Chaos and Order in the Capital Markets*.

[25]Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance* 24, 2 (1970), pp. 383–417.

Stated differently, even in an efficient market we can still make forecasts, but we have to consider the risk associated with our forecasts.

Earnings Surprises

Studies have found that it is not merely the absolute change in earnings that is important. The reason is that analysts have a consensus forecast of a company's expected earnings. What might be expected to generate abnormal returns is the extent to which the market's forecast of future earnings differs from actual earnings that are subsequently announced. The divergence between the actual earnings announced and the forecasted earnings by the consensus of analysts is called an *earnings surprise*. When the actual earnings exceed the market's forecast, then this is a positive earnings surprise; a negative earnings surprise arises when the actual earnings are less than the market's forecast.

There have been numerous studies of earnings surprises. These studies seem to suggest that identifying stocks that may have positive earnings surprises and purchasing them may generate abnormal returns. Of course, the difficulty is identifying such stocks.

Low Price-Earnings Ratio

The legendary Benjamin Graham proposed a classic investment model in 1949 for the "defensive investor"—one without the time, expertise, or temperament for aggressive investment. The model was updated in each subsequent edition of his book, *The Intelligent Investor,* first published in 1949. Some of the basic investment criteria outlined in the 1973 edition are representative of the approach:

1. A company must have paid a dividend in each of the past 20 years.
2. Minimum size of a company is $100 million in annual sales for an industrial company and $50 million for a public utility.
3. Positive earnings must have been achieved in each of the past 10 years.
4. Current price should not be more than 1.5 times the latest book value.
5. Market price should not exceed 15 times the average earnings for the past three years.

Graham considered the P/E ratio as a measure of the price paid for value received. He viewed high P/Es with skepticism and as representing a large premium for difficult-to-forecast future earnings growth. Hence, lower-P/E companies were viewed favorably as having less potential for earnings disappointments and the resulting downward revision in price.

While originally intended for the defensive investor, numerous variations of Graham's low-P/E approach are currently followed by a number of professional investment advisors.

Market-Neutral Long-Short Stratregy

An active strategy that seeks to capitalize on the ability of an investor to select stocks is a market-neutral long-short strategy. The basic idea of this strategy is as follows. First, a quantitative model is used to analyze the expected return of individual stocks within a universe of stocks. Based on this analysis, the stocks analyzed are classified as either "high-expected return stocks" or "low-expected return stocks." Based on this classification of each stock, one of the following strategies is pursued: (1) purchase only high-expected return stocks, (2) short low-expected return stocks, or (3) simultaneously purchase high-expected return stocks and short low-expected return stocks.[26]

The problem with the first two strategies is that general movements in the market can have an adverse affect. For example, suppose an investor selects high-expected return stocks and the market declines. Because of the positive correlation between the return on all stocks and the market, the drop in the market will produce a negative return even though the investor may have indeed been able to identify high-expected return stocks. Similarly, if an investor shorts low-expected return stocks and the market rallies, the portfolio will realize a negative return. This is because a rise in the market means that the investor must likely cover the short position of each stock at a higher price than which a stock was sold.

Let's look at the third alternative—simultaneously purchasing stocks with high-expected returns and shorting those stocks with low-expected returns. Consider what happens to the long and the short positions when the market in general moves. A drop in the market will hurt the long position but benefit the short position. A market rally will hurt the short position but benefit the long position. Consequently, the long and short positions provide a hedge against each other.

While the long-short position provides a hedge against general market movements, the degree to which one position moves relative to the other is not controlled by simply going long the high-expected return stocks and going short the low-expected return stocks. That is, the two positions do not neutralize the risk against general market movements. However, the long and short positions can be created with a market exposure that neutralizes any market movement. Specifically, long and short positions can be constructed

[26]Bruce L. Jacobs and Kenneth N. Levy, "The Long and Short on Long-Short," *Journal of Investing* (Spring 1997), pp. 78-88.

to have the same beta and, as a result, the beta of the collective long-short position is zero. For this reason, this strategy is called a *market-neutral long-short strategy.* If, indeed, an investor is capable of identifying high- and low-expected return stocks, then neutralizing the portfolio against market movements will produce a positive return whether the market rises or falls.

Market Anomaly Strategies

While there are investors who are skeptical about technical analysis and others who are skeptical about fundamental analysis, some investors believe that there are pockets of pricing inefficiency in the stock market. That is, there are some investment strategies that have historically produced statistically significant positive abnormal returns. Some examples of these anomalies are the small-firm effect, the low-price-earnings ratio effect, the neglected-firm effect, and various calendar effects. There are also strategies based on following the trading transactions of the insiders of a company.

Some of these anomalies are a challenge to the semistrong form of market efficiency. This includes the small-firm effect and the low price-earnings effect. The calendar effects are a challenge to the weak form of pricing efficiency. Following insider activities with regard to buying and selling the stock of their company is a challenge to both the weak and strong forms of pricing efficiency. (Recall that weak-form efficiency means that the price of the security reflects the past price and trading history of the security; strong-form efficiency exists in a market where the price of a security reflects all information, whether it is publicly available or known only to insiders such as the firm's managers or directors.) The challenge to the weak form is that, as will be explained shortly, information on *insider activity* is publicly available and, in fact, has been suggested as a technical indicator. Thus, the question is whether "outsiders" can use information about trading activity by insiders to generate abnormal returns. The challenge to the strong form of pricing efficiency is that insiders are viewed as having special (insider) information and therefore based on this information they may be able to generate abnormal returns from their special relationship with the firm.

Small-Firm Effect The *small-firm effect* emerges from several studies that have shown that portfolios of small firms (in terms of total market capitalization) have outperformed large firms. Because of these findings, there has been increased interest in stock market indicators that monitor small-capitalization firms.

Low P/E Effect Earlier we discussed Benjamin Graham's strategy for defensive investors based on low P/Es. The *low P/E effect* is supported by several studies showing that portfolios consisting of stocks with a low P/E have outperformed portfolios consisting of stocks with a high P/E. However, other studies found that after adjusting for the transaction costs necessary to rebalance a portfolio, as prices and earnings change over time, the superior performance of portfolios of low-P/E stocks no longer holds. An explanation for the presumably superior performance is that stocks trade at low P/Es because they are temporarily out of favor with market participants. As fads change, companies not currently in vogue will rebound at some time in the future.

Neglected-Firm Effect Not all firms receive the same degree of attention from security analysts. One school of thought is that firms that are essentially neglected by security analysts will outperform firms that are the subject of considerable attention. This market anomaly is referred to as the *neglected-firm effect*.

Calendar Effects While some empirical work focuses on selected firms according to some criterion such as market capitalization, P/E, or degree of analysts' attention, the calendar effect looks at the best time to implement strategies. Examples of *calendar anomalies*, as these strategies are referred to, are the January effect, month-of-the-year effect, day-of-the-week effect, intra-day effect, and holiday effect. It seems from the empirical evidence that there are times when the implementation of a strategy will, on average, provide a superior performance relative to other calendar time periods.

Following Insider Activity While the U.S. Securities and Exchange Commission (SEC) has a more comprehensive definition of an insider, we can think of insiders of a corporation as the corporate officers, directors, and holders of large amounts of a company's common stock. The SEC requires that all trading activity by insiders be reported within a specified number of days of the month following the trade. The SEC then releases this information in a report called the *SEC Insider Transaction Report*. Thus, after a time lag, the information is made publicly available. Studies have found that insiders have been able to generate abnormal returns using their privileged position. However, when outsiders use this information, one study found that after controlling for the other anomalies discussed above and transaction costs, outsiders cannot benefit from this information. In other words, insider activity information published by the SEC is not a useful technical indicator for generating abnormal returns.

One of the difficulties with assessing all of the strategies described here is that the factors that are believed to generate market anomalies are interrelated. For example, small firms may be those that are not given much attention by security analysts and that therefore trade at a low P/E. Even a study of insider activity must carefully separate abnormal returns that may be the result of a market anomaly having nothing to do with insider activity. For example, one study that found no abnormal returns from following insiders also found that if there are any abnormal returns they are due to the size and low P/E effects. There have been many attempts to disentangle these effects.

Momentum and Reversal Strategies

Families of strategies that have gained popularity are *momentum strategies* and *reversal strategies*. Momentum and reversal strategies are based on the empirical fact that large ensembles of stock prices exhibit a pattern of persistence and reversals of returns. Persistence of returns means that those stocks that had the highest returns in a given period will likely continue to exhibit high returns in the future. Conversely, those stocks that had the lowest returns in a given period will likely continue to exhibit low returns in the future.

Reversals mean that those stocks that had the highest returns in given time windows will exhibit low returns in the future, while those stocks that had the lowest returns in given time windows will exhibit high returns in the future.

The important, and somewhat surprising, fact is that there seems to be stable patterns of both momentum and reversals in the stock market. Indeed, stock prices exhibit reversals over short time windows, from a few days to one month, momentum in medium time periods from six to 12 months, and reversals over long periods, from two to five years. It has been empirically found that these patterns have remained stable for several decades in the United States and Europe. Some studies, however, seem to conclude that as of the early 2000s, it has become more difficult in some markets to profit from patterns of momentum and reversals.

PERFORMANCE EVALUATION

Performance evaluation is concerned with three questions: (1) determining whether the portfolio manager added value by outperforming the established benchmark; (2) identifying how the portfolio manager achieved the calculated return; and, (3) assessing whether the portfolio manager achieved superior performance (i.e., added value) by skill or by luck. As explained in

Chapter 1, single-index performance measures such as the Sharpe ratio does not help us address these three questions. Performance attribution models, which decompose the portfolio return so that a client can determine how the portfolio manager earned the return, are commonly used for this reason.

In broad terms, the return performance of a portfolio can be explained by three actions followed by a portfolio manager. The first is actively managing a portfolio to capitalize on factors that are expected to perform better than other factors. The second is actively managing a portfolio to take advantage of anticipated movements in the market. For example, the manager of a common stock portfolio can increase the portfolio's beta when the market is expected to increase, and decrease it when the market is expected to decline. The third is actively managing the portfolio by buying securities that are believed to be undervalued, and selling (or shorting) securities that are believed to be overvalued.

The methodology for answering these questions is called *performance attribution analysis*. There are commercially available models that can be used to do this analysis. We will not describe these models here. These models employ the factor model approach described in Chapter 13. Instead, we provide an illustration of how these models are used.

Rennie and Cowhey[27] report the performance of three external money managers for Bell Atlantic (now Verizon Communications).[28] Exhibit 9.5 shows the results for the three money managers since they began managing funds for Bell Atlantic. The values shown in parentheses in the exhibit are statistical measures that indicate the probability that the estimated value is statistically different from zero. The value in parentheses is referred to as a confidence level. The higher the confidence level, the more likely the estimated value is different from zero and, therefore, performance can be attributed to skill rather than luck.

The active management return represents the difference between the actual portfolio return and the benchmark return. Manager A's active management return is 420 basis points and, therefore, seems to have outperformed the benchmark. But was this by investment skill or luck? The confidence level of 99% suggests that it was through investment skill. The lower panel of the table shows how this was achieved. Of the four components of return, two are statistically significant—sector emphasis and security selection. The other two components—market timing and industry exposure—are not statistically significant. This means that either manager A's

[27]Edward P. Rennie and Thomas J. Cowhey, "The Successful Use of Benchmark Portfolios," in Darwin M. Bayston and H. Russell Fogler (eds.), *Improving Portfolio Performance with Quantitative Models* (Charlottesville, VA: Institute of Chartered Financial Analysts, 1989), pp. 32–44.

[28]Bell Atlantic merged with GTE to form Verizon Communications, Inc.

EXHIBIT 9.5 Performance Attribution Analysis for Three Money Managers

	Manager A		Manager B		Manager C	
Actual return	19.1%		17.0%		12.6%	
Benchmark portfolio	14.9		15.2		12.6	
Active management return	4.2%	(99)	1.8%	(53)	0.0%	(3)
Components of return:						
Market timing	–0.2%	(40)	–0.6%	(64)	–0.5%	(73)
Industry exposure	0.2	(20)	–2.0	(89)	0.3	(34)
Sector emphasis	2.2	(99)	3.9	(99)	0.3	(51)
Security selection	1.9	(84)	0.6	(43)	0.1	(7)
Unreconciled return[a]	0.1		–0.1		–0.2	

Note: Numbers set in parentheses denote confidence level.

[a]Difference between actual management return and sum of components of return.

Source: Adapted from Edward P. Rennie and Thomas J. Cowhey, "The Successful Use of Benchmark Portfolios," in Darwin M. Bayston and H. Russell Fogler (eds), *Improving Portfolio Performance with Quantitative Models* (Charlottesville, VA: Institute of Chartered Financial Analysts, 1989), p. 37.

skills in these two areas did not significantly impact the portfolio's return, or the manager did not emphasize these skills. In fact, this manager's stated investment style is to add value through sector emphasis and security selection and neutralize market timing and industry exposure. The results of the performance attribution analysis are consistent with this investment style.

An analysis of the results of manager B indicates that the manager outperformed the benchmark by 180 basis points. The confidence level, however, is 53%. In most statistical tests, this confidence level would suggest that the 180 basis points is not statistically different from zero. That is, the 180-basis-point active management return can be attributed to luck rather than skill. However, Rennie and Cowhey state that this is an acceptable level of confidence for Bell Atlantic, but that it does provide a warning to the company to carefully monitor this manager's performance for improvement or deterioration. The stated investment style of this manager is to identify undervalued securities. The component return of 60 basis points from security selection with a confidence level of only 43% suggests that this manager is not adding value in this way. This is another warning sign that this manager must be more carefully monitored.

Manager C has to be carefully monitored because this manager did not outperform the benchmark, and none of the component returns are statistically significant. This manager is a candidate for termination. What is

the minimum active management return that Bell Atlantic expects from its active equity managers? According to Rennie and Cowhey, it is 1% per year over a 2.5-year investment horizon with a confidence level of at least 70%. Moreover, the component analysis should corroborate what the manager states is the manager's investment style.

KEY POINTS

- The decision as to whether to pursue an active or passive strategy depends on the view of the price efficiency of the market. A price efficient market is one where security prices at all times fully reflect all available information that is relevant to their valuation. The distinction between the three forms of pricing efficiency—weak form, semi-strong form, and strong form—rests in the relevant information that is believed to be embodied in the price of the security at all times.
- Active strategies are those that seek to outperform the market based on the belief that there are abnormal returns due to the existence of some pricing inefficiencies. Investors who believe that the market prices stocks efficiently and that active management will not generate abnormal returns will pursue a passive strategy, the most popular passive strategy being indexing.
- Tracking error measures the dispersion of a portfolio's returns relative to the benchmark's returns. That is, tracking error is the standard deviation of the portfolio's active return where active return is the difference between the portfolio return and the benchmark return. Backward-tracking error is calculated from historical active returns; forward-tracking error is computed using the portfolio's current holdings based on a statistical model developed using historical tracking error.
- The information ratio is a reward-to-risk ratio where the numerator is the average active return (alpha) and denominator is the backward-looking tracking error. The higher the information ratio, the better the manager performed relative to the risk assumed.
- Managers can be classified based on investment style. A manager's style depends on the characteristics of the stocks purchased. Stocks can be classified by style in many ways. The most common is in terms of one or more measures of growth and value. Moreover, within a growth and value style there is often a sub-style based on size (i.e., market capitalization).
- In constructing an indexed portfolio, a manager can purchase all the stocks in the index or only purchase the largest market capitalization stocks (capitalization approach). Two alternative methodologies for

constructing an indexed portfolio where less than all the stocks are purchased are the cellular method and the multifactor risk model method.

- Active strategies can be classified as following either a top-down approach or a bottom-up approach. In a bottom-up approach to active management, there are three types of security analysis styles that are employed in practice: traditional fundamental analysis, quantitative fundamental analysis, and value-based metric analysis.
- The fundamental law of active management is used to explain how the information ratio changes as a function of time. According to the fundamental law, the information ratio depends on the manager's skill (as measured by the information coefficient) and the breadth or number of independent insights or investment opportunities available to the manager.
- Technical analysis involves investigating patterns based on historical trading data (past price data and trading volume) to forecast the future movement of individual stocks or the market as a whole. Based on observed patterns, mechanical trading rules indicating when a stock should be bought, sold, or sold short are developed without any consideration given to any factor other than the specified technical indicators.
- Fundamental analysis involves an economic analysis of a firm with respect to earnings growth prospects, ability to meet debt obligations, competitive environment, and the like.
- Performance evaluation is concerned with three questions: (1) determining whether the portfolio manager added value by outperforming the benchmark; (2) identifying how the portfolio manager achieved the calculated return; and, (3) assessing whether the portfolio manager achieved superior performance by skill or by luck. Performance attribution models can answer these three questions by decomposing the portfolio return into the factors that affect performance and then assess the statistical significance of the decisions made by the manager.

QUESTIONS

1. In constructing an equity portfolio, which type of tracking error—backward-looking or forward-looking should be used?
2. Calculate the annualized alpha, tracking error, and information ratio based on the 12 monthly returns below:

Month	Active Return %
1	0.37
2	–0.31
3	–0.55
4	0.09
5	0.37
6	–0.05
7	–0.62
8	0.06
9	0.46
10	–0.09
11	0.58
12	0.84

3. Assuming active returns are normally distributed, calculate the expected returns about the benchmark at the 67%, 95%, and 99% confidence levels assuming the following data:

Expected active return %	0.02
Tracking error %	0.03
Benchmark expected return %	0.08

4. Explain the philosophy of a
   a. contrarian manager.
   b. yield manager.

5. Determine the size and style orientation of the following equity mutual fund

	$ Market cap (MC)		Portfolio	
	(in billions)	$MC^{(1/n)}$	Cap weight	PB ratio
Stock A	18	2.620488909	0.2000	0.8
Stock B	30	3.106880249	0.3333	1.0
Stock C	42	3.475593597	0.4667	1.4

6. Construct a graph showing combinations of breadth and depth to produce constant information ratio (IR) with an alpha of 3% and a tracking error of 4%.

7. Use portfolio attribution analysis to assess the active strategies of two managers with the same alpha:

	Manager X	Manager Y
Active management return (alpha) %	3.5	3.5
Components of active return:		
Market timing	–0.2	–0.1
Sector emphasis	0.5	2
Industry exposure	1.5	1.4
Security selection	2	0.5
Unreconciled return	–0.3	–0.3

ANSWERS

1. Forward-looking tracking error should be used since that metric will determine future performance relative to a benchmark.

2.

Monthly Average %	0.0958	
Monthly St. Deviation %	0.4495	
Alpha (annualized)	1.15	
Tracking Error (TE)	1.56	
(Annualized St. Deviation)		
Information ratio	0.74	Alpha/TE

3.

	Standard Deviation Units	Range of Expected Active Return:	
		Lower	Uppper
67% Confidence Interval	1	0.05	0.11
95% Confidence Interval	2	0.02	0.14
99% Confidence Interval	3	–0.01	0.17

4. a. A contrarian manager looks at the book value of a company and focuses on those companies that are selling at low valuation relative to book value. The companies that fall into this category are typically depressed cyclical stocks or companies that have little or no current earnings or dividend yields. The expectation is that the stock is on a cyclical rebound or that the company's earnings will turn around. Both of these occurrences are expected to lead to substantial price appreciation.

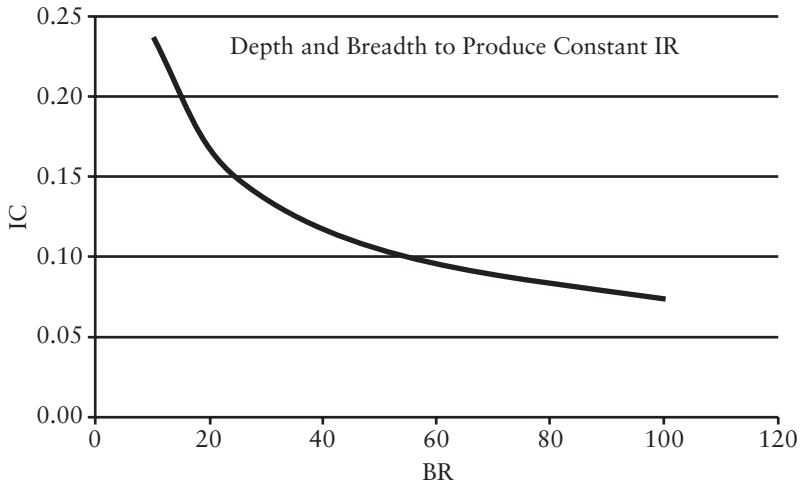
b. A yield manager is the most conservative value manager. A manager who follows this strategy looks at companies with above average dividend yields that are expected to be capable of increasing, or at least maintaining, those yields.

5.

	$ Market cap (MC)		Portfolio	
	(in billions)	$MC^{(1/n)}$	Cap Weight	PB ratio
Stock A	18	2.620488909	0.2000	0.8
Stock B	30	3.106880249	0.3333	1
Stock C	42	3.475593597	0.4667	1.4
Cumulative ($ Billion)	90			
Weighted PB ratio				1.15
Benchmark PB ratio (given)				2.00
Geometric average fund size ($Billion)	28.30			
Size classification	Large cap			
Style orientation	Value			

6. Information ratio = 0.75

Breadth (insights)	$Breadth^{0.5}$	Breadth (insights)	Depth (Information coefficient)
10	3.16	10	0.24
20	4.47	20	0.17
30	5.48	30	0.14
40	6.32	40	0.12
50	7.07	50	0.11
60	7.75	60	0.10
70	8.37	70	0.09
80	8.94	80	0.08
90	9.49	90	0.08
100	10.00	100	0.075



7. Manager X earns alpha mostly from security selection; manager Y earning alphas mostly from sector exposure.