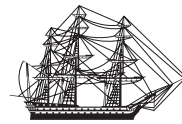


Market Indexes: Determining the Appropriate Benchmark

Vanguard Investment Counseling & Research



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Executive summary

Investors charged with overseeing a portfolio, either for themselves or for an institution, often look at benchmarks to gain perspective on how they are doing. Absolute results reveal little about why a gain or loss occurred; for example, was it a result of buying decisions, of sector weightings, of market trends, or a combination? Relative results—obtained through comparison with market indexes—can shed considerable light on such questions.

The major market indexes all come from long-established, well-respected providers, and investors generally assume that all are equally fair, relevant, and accurate representations of market performance. Applied correctly, the indexes are indeed valuable tools for judging investment returns.

Indexes from different providers are constructed very differently. The variety of methodologies can lead to very different results, even when measuring similar market segments. This may result in incorrect or misleading conclusions about the relative investment performance of a portfolio manager or a mutual fund.

For example, for the ten years ended December 31, 2005, the Russell 2000 Index, a widely used small-cap benchmark, returned an average of 9.3% annually. Over the same period, the S&P SmallCap 600 Index, another benchmark for small-cap

companies, returned 12.2% a year. Given this disparity between indexes tracking companies of similar size, what light do they shed on the performance of a small-cap mutual fund that returned 10% annually over the period?

Given a benchmark's potential impact on investment decisions for both portfolio managers and those charged with evaluating managers, it is important to understand the measurement tool being employed. This report examines how the most prominent benchmark providers construct and maintain their measures, and offers insight into the limitations and challenges of certain methodologies. Investors need to analyze benchmarks critically to ensure that the ones they use are appropriate for the investment vehicle involved. Only then can performance differences be analyzed with confidence.

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A review of the basics

Index construction

Building an index requires decisions on four key issues:

- Security selection.
- Security weighting.
- The mathematical equation used to calculate the index's return.
- Maintenance of the index.

Tables 1 and 2 show how some of the major index providers differ on specific criteria such as universe definition, types of issues, and weighting methods.

While there are many similarities among the equity index providers, each has unique aspects. For example: Dow Jones Wilshire is the only provider that maintains an index covering the entire U.S. equity market.¹ Standard & Poor's indexes are maintained according to criteria subjectively monitored by an in-house committee. Russell's methodology is based on market value.

The main difference between the fixed income providers is that Lehman Brothers works with the investment community to create and maintain the rules for inclusion, whereas Citigroup sets and maintains its rules with limited outside consultation.

Table 1. Primary Equity Indexes

	S&P	Dow Jones Wilshire	Russell	MSCI
Number of securities	Fixed number of stocks (e.g., S&P 500 includes 500 stocks).	Dow Jones Wilshire 5000 Index includes all companies headquartered and traded in the United States; number of securities varies over time.	Fixed number of publicly traded U.S. stocks (e.g., Russell 3000 Index includes largest 3,000 stocks).	MSCI US Broad Market Index targets 99.5% of cumulative full market capitalization of the U.S. equity universe; number of securities varies over time.
Liquidity requirements	Criteria defined by an S&P committee.	Stock must meet minimum threshold for trading volume.	Security must trade above \$1 on May 31.	Measured by price for a relative criterion known as Annualized Traded Value Ratio.
Securities include . . .	Companies representing current aggregate economic conditions in the opinion of the S&P committee.	Common stocks, REITs, and limited partnerships.	Publicly traded companies based in the United States or U.S. territories.	U.S. common stocks, REITs, and select non-U.S.-domiciled stocks trading in the United States.
Weighted by . . .	Free-float adjusted market value.	Full market value. (Free-float adjusted version also available.)	Full market value, adjusted for free float only after inclusion in the index.	Full market value, adjusted for free float prior to inclusion in the index.

Note: *Full market value* refers to the total outstanding value of all shares. However, not all of a company's shares may be available for trading on the open market. The major index providers therefore adjust the weighting to reflect free float, defined as the shares available to be actively traded by the investing public. The impact of free float is discussed under **Guidelines for the practitioner** on page 6.

Sources: Standard & Poor's, Wilshire Associates, Frank Russell Co., and Morgan Stanley Capital International.

¹ The Dow Jones Wilshire 5000 Composite Index.

Table 2. Primary fixed income indexes

	Lehman	Citigroup
Number of securities	All outstanding debt issues meeting index rules; number of securities varies over time.	All outstanding debt issues meeting index rules; number of securities varies over time.
Liquidity requirements	\$250 million minimum for government issues, \$250 million for corporate issues, \$250 million for asset-backed issues.	\$1 billion minimum for U.S. Treasury issues, \$500 million for U.S. agency and corporate issues.
Securities include . . .	Fixed-rate debt issues rated investment-grade or higher	Fixed-rate debt issues rated investment-grade or higher
Weighted by . . .	Total market value of outstanding issues, using the security's beginning-of-period market value.	Total market value of outstanding issues, using the security's beginning-of-period market value.
Minimum rating	The lower of Baa3 by Moody's or BBB- by S&P and Fitch.	BBB- or Baa3 by either S&P or Moody's.
Pricing	Priced by Lehman Brothers traders. In the Credit Index, about 200 securities are priced (bid-side) by traders and the rest by using matrix pricing algorithms. At mid-month and month-end, all are by Lehman traders.	For monthly returns, bid-side prices are collected on the last business day of the month. For daily calculations, trader pricing may be supplemented with matrix pricing (for U.S. corporate and agency bonds only).
Settlement	Monthly calculation: Indexes settle on the first day of the following month. Daily calculation: Indexes settle on the next calendar day (except for mortgages, which are priced in the following month and discounted back at the mortgage repurchase rate).	Monthly calculation: Indexes settle on the last calendar day of the month. Daily calculation: Indexes settle on a same-day basis.

Sources: Lehman Brothers and Citigroup.

Table 3. Methodologies: Formulas and subjective

	Formula-based	Subjective or rules-based
Providers	Russell, Dow Jones Wilshire.	Citigroup, Lehman, MSCI, S&P.
Process	All available stocks are ranked by market cap in descending order and then divided into the appropriate indexes. For example, the Russell 3000 Index tracks the largest 3,000 companies in the United States. Stocks ranked from 1 to 1,000 become the Russell 1000 Index; stocks ranked from 1,001 to 2,000 become the Russell 2000 Index.	Inclusion is determined by a committee or by applying specific criteria. The criteria vary and are regularly reevaluated, but may include market cap, earnings history, business longevity, liquidity, and (for bonds) credit rating or issue size.

Source: Vanguard Investment Counseling & Research.

Table 4. Security weighting methodologies

Type of weighting	Process	Examples
Market Cap	Equity <ul style="list-style-type: none"> Each stock's price is multiplied by the number of shares outstanding to determine its weighting. The index may use total market cap or a market cap that is adjusted for free float. 	<ul style="list-style-type: none"> S&P Dow Jones Wilshire Russell MSCI FTSE
	Fixed Income <ul style="list-style-type: none"> The index uses the market weight of all outstanding bond issues that meet the inclusion rules. 	<ul style="list-style-type: none"> Lehman Citigroup JP Morgan Merrill Lynch
Price	<ul style="list-style-type: none"> A security's importance in the index is determined by the price. A higher-priced stock receives a larger weighting regardless of the size of the issuing company. 	<ul style="list-style-type: none"> Dow Jones Industrial Average Nikkei 225
Equal	<ul style="list-style-type: none"> Each company in the index is given the same weight. 	<ul style="list-style-type: none"> Value Line S&P Equal Weight Index
GDP	<ul style="list-style-type: none"> In some international indexes, country weightings are determined by the relative size of each nation's gross domestic product (a proxy for the size of its economy). 	<ul style="list-style-type: none"> MSCI GDP Indexes
Fundamental	<ul style="list-style-type: none"> Weightings are determined by a formula using balance-sheet and income statement fundamentals. 	<ul style="list-style-type: none"> FTSE Research Affiliates Fundamental Indexes S&P, Morningstar, Dow Jones dividend-focused indexes

Source: Vanguard Investment Counseling & Research.

Security selection

Securities are selected for inclusion on either a subjective or an objective basis. Subjectively based methodologies typically screen stocks via a range of criteria and then employ some element of judgment in the final decision. Objective methodologies simply apply a set of rules to determine a security's eligibility for an index. Table 3 gives details of these approaches.

Security weighting

Different providers assign weightings differently (see Table 4). In the equity markets, market-cap weighting is the most commonly used methodology. Equal weighting and weighting by price, GDP, or other variables are used as well, but to a much lesser degree. Fixed income indexes use the market weightings of outstanding issues to weight each company.

Weighing 'weightings'

In an index, the term *weighting* refers to the proportion of overall market capitalization allocated to a given type of investment—a company or an industry sector, for example. In a mutual fund, weighting refers to the proportion of net assets allocated to a type of investment.

In a market-cap-weighted index, a company's market value determines how that security will be employed in calculating the index return. Obviously, a security or a sector with a large weighting will have a proportionately high impact on return.

Analysts commonly talk of whether an investment portfolio is overweighted or underweighted in certain holdings relative to a given index. For example, a fund might be described as overweighted in health care relative to the S&P 500 Index if the sector represents, say, 15% of index capitalization but 25% of the fund's net assets. Does this information have any meaning in a performance evaluation? That depends on the investment objective of the fund, and on what the manager was trying to achieve.

Table 5. Return calculations

Style	Process
Market-cap-weighted	<ul style="list-style-type: none"> • Each company's market capitalization is calculated. • The market caps of all companies are combined, and the total for the index is linked to an arbitrary initial index number. • A divisor is calculated that will balance the equation to the initial index number. • The divisor is adjusted over time to reflect changes in the index.
Price-weighted	<ul style="list-style-type: none"> • The prices of all stocks in the index are totaled, and the sum is divided by a base number that is adjusted over time for changes in the index. The result is then compared to an established starting value to calculate the index's movement. • The index value changes in proportion to the price changes of the individual companies.
Equal-weighted	<ul style="list-style-type: none"> • The mean return of the component stocks is computed. • The mean return is then used to compound the previous period's value forward to the current period.
Fixed income total return	<ul style="list-style-type: none"> • <i>Beginning-of-period value</i> = [(Beginning price x Par value) ÷ 100] + Beginning accrued interest. • <i>End-of-period value</i> = [(Ending price x Par value) ÷ 100] + Ending accrued interest + Coupon payments + Principal payments + Reinvestment income. • <i>Total rate of return (%)</i> = [(Ending value ÷ Beginning value) - 1] x 100

Example: If the total market capitalization of three stocks is \$10,000,000, and the initial index value is set at 100, the divisor for the index is 100,000. As the prices of the stocks in the index change, the market cap of the overall index will change proportionally to the market cap of the individual securities. If the total market cap grew to \$10,500,000, the new index value would be 105, or \$10,500,000 ÷ 100,000. The percentage change in the index would be 5%, or (105 - 100) ÷ 100.

Source: Vanguard Investment Counseling & Research.

Return calculation

Return calculations generally are similar for all the methodologies. The values of individual securities are totaled, and that total is linked to an initial value, which is adjusted for index reconstitutions and capital events affecting outstanding shares such as issuances or repurchases, stock dividends, and rights or warrant offerings. Fixed income indexes generally assume that each security is purchased at the beginning of the period and sold at the end of the period (bid-side valuations are used). Specific

calculations for market-cap-weighted, price-weighted, and equal-weighted benchmarks are described in Table 5.

Maintenance

All equity index providers periodically adjust the membership to reflect changes that occur in the market as well as those made necessary by corporate actions such as mergers or spin-offs. Each provider has its unique aspects, however. For example: Additions to Dow Jones Wilshire indexes generally occur at the end of each month. S&P indexes are reconstituted as needed; S&P's index committee usually meets monthly to evaluate the benchmarks, but may meet more often. Morgan Stanley Capital International conducts a quarterly review to assess economic and market conditions and an annual review to reassess the universe of equities across all countries. Russell reconstitutes its indexes annually, using May 31 market capitalization data and implementing the changes on June 30.

As for the fixed income providers, both Lehman and Citigroup reconstitute their investment-grade indexes at month-end. Returns for each month are based on the securities listed in the index at the beginning of that month (meaning that, for the purposes of return calculations, securities are not dropped until month-end even if they default or otherwise become ineligible).

Guidelines for the practitioner

Those charged with evaluating investment managers' performance against an index should be aware of these key issues that may affect the assessment:

- The influence of index weighting methodology.
- The effect of frictionless trading.
- The treatment of free float in determining weightings.
- The variance in style definitions.
- Style drift.

An understanding of these issues can provide deeper insight into the relative performance of a manager or index.

The influence of overall weighting strategies

As common sense would suggest, the way securities are weighted has an important influence on index returns. Although price-weighted and equal-weighted benchmarks are mentioned in the financial media, the performance of most equity managers is compared with market-cap-weighted indexes. All fixed income indexes are market-value-weighted, but the methodology employed may present special concerns in the evaluation process.

Market-cap weighting

By definition, the performance of indexes built on market capitalization will be heavily influenced by the largest companies included. For example, in the 1980–2005 period, the top 50 companies in the S&P 500—or 10% of the index's constituency by number—accounted for an average of 49.5% of its total market capitalization. In 1998, these companies generated a combined return of 21.1%, while the remaining 450 gained 7.4%. Portfolio managers who either did not own or underweighted this group lagged the index.

For a market-weighted bond index to be accurate on a daily basis, the provider must know the outstanding amount of each issue every day. The lack of active trading, however, makes this impossible to determine. Instead, bond indexes use the last-known market weightings, adjusted

for known events such as new issues and maturities. Concerns may arise with pricing and weighting methodology, however, if the provider uses original-issue values to price a fixed income index. For example, because Citigroup and Lehman calculate total returns using the beginning-of-period weight and value of each security, any Treasury or agency issues that have been stripped during the period, creating zero-coupon bonds, will be overweighted for that period (Ryan, 2006).

Price weighting

Price-weighted indexes tend to favor stocks with high prices, regardless of the company's actual size.

Equal weighting

Equal weighting makes no distinction between securities, so an equally weighted benchmark will reflect simply the average return per issuer in its market. This methodology helps ensure against any one stock's dominating the performance of the index, but it gives smaller constituents a potentially outsized influence. The performance of equal-weighted indexes favors smaller companies for two reasons: There are many more small companies than large companies, and smaller companies tend to grow faster than larger ones.

GDP weighting

Used in some global benchmarks, Gross Domestic Product (GDP) weighting emphasizes a country's economic size and growth rates rather than the capitalization of its equity market. This methodology assumes there is a link between the size of a country's economy and the performance of the country's stock market. GDP weighting was favored by some market participants to reduce the concentration of Japanese stocks in international indexes during the 1980s, when Japan constituted a very large portion of those benchmarks based on market capitalization. For example, in 1987, GDP weighting would have reduced the representation of Japan in a global index from approximately 45% to 30%.

Fundamental-value weighting

Indexes based on fundamentals use company balance-sheet and income-statement values rather than market capitalization to determine index weightings. These indexes weight stocks on the basis of formulas that use financial data such as book value, cash flow, revenues, sales, and dividends. Depending on which of these fundamentals are used, the indexes may display “tilts,” such as a value bias or a small-cap bias.

Frictionless trading

Because an index does not actually purchase and sell securities, its additions and deletions are “frictionless,” meaning that no transaction costs are incurred. But managers do incur transaction costs when they buy and sell securities. This creates an unavoidable drag on performance, which is exacerbated for mutual funds that seek to track benchmarks that exhibit high turnover. Capitalization-weighted indexes with strict parameters can be particularly liable to such turnover at times of market volatility. For example, in 2001, approximately one-third of the Russell 1000 Index changed on June 30, forcing index fund managers and others closely benchmarked to the Russell 1000 to make similar changes.

Selecting a benchmark that reduces or eliminates such forced turnover would therefore seem to be in a manager’s best interest. For equity indexes, one potential solution is to define market capitalization as a band of values, without strict cutoff points at top and bottom. (MSCI has adopted this approach.) Viewing “large-cap,” “mid-cap,” and “small-cap” as terms for capitalization ranges without crisp demarcations is akin to the way portfolio managers actually think. This approach could mitigate much of the forced turnover typical of indexes subject to formula-based capitalization rules (Sauter, 2002).

The frictionless quality of indexes hampers performance comparisons in another respect as well: Indexes don’t have to find buyers or sellers, whereas managers do. This is especially significant in fixed

income indexes. When a bond no longer qualifies for inclusion in an index—because of a credit-rating change, for example—it is removed from the index at the bid-side price at month-end. Depending on the direction of the rating change, liquidity for the affected issues can be significantly reduced. If a manager must sell a particular security because it no longer meets the portfolio’s credit-quality guideline, there may be a wait before buyers emerge. In the interim, the security’s continued presence in the portfolio may materially hurt performance relative to the benchmark index.

A notable example was WorldCom. When WorldCom declared bankruptcy in July 2002, all of its outstanding debt was immediately dropped from fixed income indexes. Managers running portfolios that prohibited junk bonds then had to liquidate their positions—and they had to do so not only at prices lower than the bonds’ final prices in the indexes, but in a trading environment with notably fewer buyers.

Total market value versus free float

When company insiders, governments, or other businesses own shares they don’t intend to sell, those shares are unavailable to be traded on the open market. For a benchmark to be truly representative of the tradable shares, a free-float adjustment must be made: The value of the nontradable shares must be subtracted from the stock’s weighting in the index. If this is not done, companies with unavailable shares are given a larger influence in the index than they have in the open market. Their returns affect the index calculations disproportionately, and to that degree the index result does not accurately reflect the market. This factor affects analysis not only of indexed investments but of actively managed portfolios as well. The adjustment for free float is calculated using the market value of the shares available to be traded. If 60% of a company is available to be traded on the open market, then the security is given 60% of the weight it would have received by using full market value.

Lockheed Martin illustrates the free-float problem. Less than 60% of Lockheed's shares are available to be traded on the open market. As a result, when an index that does not adjust for free float includes the company, the stock gets significantly greater representation than it has in the open market. Another example is United Parcel Service, which maintains two classes of common stock, only one of which is freely traded on the open market (United Parcel Service, 2005). The class that is traded accounts for just 50.4% of all UPS shares, but the remainder contributes to the stock's weighting in non-free-float-adjusted indexes.

Index providers that do not adjust for free float believe it is important to represent the true economic value of each company. Shares that are not traded still represent part of the company's fundamental worth. However, an index that includes nontradable shares is representing part of the market that is not actually available to portfolio managers and other investors. To that degree, the index is a less-useful yardstick for their performance.

Style definitions

Different criteria for style definition can often lead to mixed signals about portfolio results. Table 6 illustrates the differing methodologies used in constructing S&P/Citigroup, Russell, and MSCI indexes. Russell uses two primary variables to determine the growth or value nature of a security, while S&P uses seven and MSCI uses six. In the real world, portfolio managers typically look at many variables—not just one or two—when determining the style bias of a stock. With recent changes to their indexes, MSCI and S&P have attempted to reflect this thinking, and have thereby created more effective style benchmarks.²

Different methodologies, combined with differences in representation, can produce strikingly different results. For example, for the ten years ended December 31, 2005, the Russell 1000 Growth Index gained an average of 6.7% annually,

the MSCI US Prime Market Value index gained an average of 7.3% annually, and the S&P/Citigroup 500 Growth Index gained an average of 8.4% annually. A large-cap growth manager who returned 7.5% would look great relative to the Russell benchmark, on par with the MSCI benchmark, but poor relative to the S&P benchmark.³

Style drift

Style drift refers to a fund manager's or a benchmark's deviation from the expected investment style. This drift often occurs gradually—for example, when a small-cap manager buys larger and larger companies as fund assets grow. When investors notice, the manager may be called to account. Style drift in an index, however, is often overlooked.

Not surprisingly, the number of variables used to construct a benchmark will have a significant impact on how the index changes over time. Those with fewer factors will likely see greater turnover in constituents, potentially causing style drift during periods of outperformance by one style. This potential for drift is one reason that index providers have been moving to include more criteria to categorize growth and value stocks.

The stock bubble of the late 1990s provided clear examples of style drift caused by the use of simplistic criteria. At the time, prominent growth and value indexes reflected a 50/50 split of the market capitalization of a parent index. As the market soared, many companies experienced extraordinary growth in market cap, as did the indexes themselves. When the style indexes were rebalanced, the need to keep market cap evenly divided meant that many companies moved from growth indexes into value indexes. This often resulted in noticeable style drift: The value indexes got "growthier," and the growth indexes became more concentrated in larger-cap stocks. For indexes with a greater number of style criteria, or sub-indexes not required to sum to the parent index, style drift would be expected to be less of a concern, but should still be monitored.

2 Until May 2005, S&P used just one factor, the price/book ratio, to determine a stock's style. S&P ranked companies in a parent index according to their price/book ratios, then allocated the stocks to the growth and value sub-indexes in such a way that 50% of the parent's market cap was represented in each.

3 Because of the new methodologies being employed by S&P and MSCI, the dispersion of index returns may be quite different in future periods.

Table 6. Style indexes: A comparison of criteria

	S&P/Citigroup style indexes	Russell style indexes	MSCI style indexes
Criteria for growth or value	<p>Value indexes:</p> <ul style="list-style-type: none"> • Price/book ratio • Price/cash-flow ratio • Price/sales ratio • Dividend yield <p>Growth indexes:</p> <ul style="list-style-type: none"> • 5-year EPS growth • 5-year sales growth • 5-year internal growth rate 	<ul style="list-style-type: none"> • Price/book ratio • Long-term growth mean forecast by the Institutional Brokers Estimate System <p>Companies may be classified proportionally in both growth and value indexes.</p>	<p>Value indexes:</p> <ul style="list-style-type: none"> • Price/book ratio • 12-month forward EPS • Dividend yield <p>Growth indexes:</p> <ul style="list-style-type: none"> • Long- and short-term forward EPS growth rates • Current internal growth rate • Long-term historical EPS growth trend • Long-term historical sales/share growth trend <p>Companies may be classified proportionally in both growth and value indexes.</p>
Process	<ul style="list-style-type: none"> • Stocks are ranked on the basis of growth and value scores and sorted by growth/value rank. • The top 33% of the total market cap of the index is designated as the pure growth basket. • The bottom 33% of the total market cap of the index is designated the pure value basket. • The stocks in the middle represent both growth and value characteristics. • Middle-ranked stocks are distributed in the style indexes based on their distances from the midpoint between the value and growth baskets. 	<ul style="list-style-type: none"> • The two criteria form the basis for a composite score, which Russell employs to split a stock between growth and value indexes. 	<ul style="list-style-type: none"> • A score for each variable is computed using its market-cap-weighted mean. • Combined value and growth attributes are used to determine the positioning of each security.

Sources: Standard & Poor's, Frank Russell Co., and MSCI.

Conclusion

Plainly, all performance measures are not created equal—nor are they intended to be. And none is perfect for every situation. Different averaging and construction methodologies can lead to varying and sometimes contrary conclusions. But once an investor understands this, what is he or she to do with the knowledge? Here are three suggestions:

- Before making an investment decision based solely on a performance comparison with an index, consider whether the benchmark truly represents the fund you have targeted. Is it the most appropriate benchmark for the investment in the role you have assigned to it? If your investment goal is to maintain exposure to a particular segment of the market—say, large-cap value—then both the fund you select and the benchmark against which you evaluate it should be an accurate representation of the large-cap value segment. For this purpose, it would be a mistake to either choose or rule out a fund on the basis of a comparison with the overall S&P 500 Index.
- In analyzing an investment's performance, pay attention to the characteristics of both the investment and the benchmark you are using. How do they compare in terms of such fundamentals as overall price/earnings ratio, price/book ratio, or yield, for example? If a trend in relative performance has changed, is it because the investment manager is doing something differently, or has the benchmark changed? Did fund results differ from benchmark results because the manager drifted from the targeted style or size of the fund intentionally or unintentionally?

- When you review economic analyses in the press, or financial reports from a company, examine performance comparisons critically. Is a portfolio manager being praised—or criticized—for results that differ from those of a major market index? If so, consider whether it is a valid comparison. The underlying causes of performance variation should be evaluated in the proper context, not on what is commonly reported.

To sum up: Investors should not use any single measure exclusively. By taking a close look to ensure that their chosen measurement tools are appropriate for assessing relative performance, investors can gain a better understanding of where their portfolio stands in relation to their investment objectives.

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