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The Information Ratio

Thomas H. Goodwin

Despite the widespread use of information ratios to gauge the performance of active money managers, confusion persists over how to calculate an information ratio, how to interpret it, and what constitutes a "good" one. The argument here is that the simplest form and interpretation of the ratio is the most useful for investors. This article clarifies the relationship between an information ratio and a t-statistic, compares four methods of annualizing an information ratio, and presents the empirical evidence on the distribution of information ratios by style, which provides a context in which to examine manager performance.

Most money managers routinely report their products' information ratios to investors, and some investors rely heavily on information ratios to hire and fire money managers. The purpose of this article is to clear up some of the confusion that exists about information ratios despite their widespread use.

The Ratio Defined

The information ratio is a measure that seeks to summarize in a single number the mean–variance properties of an active portfolio. It builds on the Markowitz mean–variance paradigm, which states that the mean and variance (or mean and standard deviation) of returns are sufficient statistics for characterizing an investment portfolio. Calculation of an information ratio is based on the standard statistical formulas for the mean and standard deviation. If R_{Pt} is the return on an active portfolio in period t and R_{Bt} is the return on a benchmark portfolio or security in period t, then ER_t, the excess return, is the difference:

$$ER_t = R_{Pt} - R_{Bt}. \tag{1}$$

$\overline{ER}$ is the arithmetic average of excess returns over the historical period from $t = 1$ through T:

$$\overline{ER} = \frac{1}{T}\sum_{t=1}^{T} ER_t, \tag{2}$$

and $\hat{\sigma}_{ER}$ is the standard deviation of excess returns from the benchmark, or tracking error, for the same period:

$$\hat{\sigma}_{ER} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(ER_t - \overline{ER})^2}. \tag{3}$$

The information ratio based on historical data, IR, is simply the ratio of the return and standard deviation:

$$IR = \frac{\overline{ER}}{\hat{\sigma}_{ER}}. \tag{4}$$

A historical information ratio is easy to calculate using the standard statistical functions in most spreadsheets.

Interpretations of the Ratio

The information ratio is the average excess return per unit of volatility in excess return. That definition simply puts the statistical formula into words, however, without any indication of what the ratio has to do with information. The first step in gaining some insight into this question is to set up a particular variation of the linear market model:

$$(R_{Pt} - R_{ft}) = \alpha + \beta(R_{Bt} - R_{ft}) + \varepsilon_t, \tag{5}$$

and

$$\text{var}(\varepsilon_t) = \omega^2,$$

where R_{ft} is the hypothetical risk-free rate, usually proxied by the one-month or three-month U.S. T-bill return.

The situation with the most straightforward interpretation is one in which the active manager is confined to the universe of a benchmark index—say, the S&P 500 Index or the Russell 1000 Index—and must maintain the same level of systematic risk as the index. In that case, $\beta = 1$ and

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$$(R_{Pt} - R_{ft}) = \alpha + (R_{Bt} - R_{ft}) + \varepsilon_t, \tag{6a}$$

which can be rearranged as

$$\begin{aligned}(R_{Pt} - R_{ft}) - (R_{Bt} - R_{ft}) &= (R_{Pt} - R_{Bt}) \\ &= ER_t \\ &= \alpha + \varepsilon_t.\end{aligned} \tag{6b}$$

The active manager can add value only by underweighting or overweighting individual securities relative to the benchmark index weights while maintaining the same level of market risk.

Equation 6 shows that the excess return over the benchmark is the sum of alpha plus residual risk. The information ratio is then the risk-adjusted alpha:

$$\begin{aligned}IR &= \frac{\overline{ER}}{\hat{\sigma}_{ER}} \\ &= \frac{\alpha}{\omega}.\end{aligned} \tag{7}$$

The under- and overweightings represent the active manager's bets based on the special information, or skill, the manager possesses—hence the name.

In this interpretation, the information ratio measures the quality of the manager's information discounted by the residual risk in the betting process. The information ratio is also known in the finance literature as the "alpha–omega ratio," a term that came from the common textbook habit of using the Greek letters α and ω to represent, respectively, excess return and idiosyncratic risk. Alternative terminology that borrows from engineering calls alpha the "signal" and calls the residual risk "noise," so from an engineering perspective, the information ratio is the signal-to-noise ratio of the active manager. Additional synonyms are "return-to-variability ratio" and "appraisal ratio."

Information Ratios with an Estimated Beta. Some analysts prefer to construct an information ratio from estimating Equation 6 by least squares regression. Then, the α of Equation 7 becomes the estimated intercept and ω is the standard error of the regression. A common reason for this approach is to avoid rewarding managers for taking on more risk than the benchmark. The rationale is that if the estimated β is greater than 1, the estimated α will be smaller than it would be if β were fixed at 1, which, all else being equal, will decrease the information ratio. However, all else is not equal, because the estimated ω will also be smaller as a result of least squares minimization. Thus, compared with an information ratio with a β fixed at 1, an information ratio with an estimated β greater than 1 can either raise or lower the information ratio of a manager who takes on more than benchmark risk.

If the estimated β is *less* than 1, however, the information ratio will increase, without doubt, because the estimated α will be larger but the estimated ω will be smaller.

So, estimated beta rewards managers who take on less than the benchmark risk with a higher information ratio. In addition, estimated β suffers from a well-established temporal instability, and moving to a multifactor model to enhance stability only raises questions of how many and what factors are appropriate.

In contrast to constructing an information ratio from estimating Equation 6 by least squares regression, the simple information ratio presented in Equation 4 can be thought of as an *ex post*, model-free measure that is universally applicable and relatively stable over time. The key assumption is that the benchmark roughly matches the systematic risk of the manager, so fixing β at 1 is sensible. Therefore, the simple information ratio is most useful when the benchmark has been carefully chosen to match the style of the manager.

Information Ratios, Information Coefficients, and the Fundamental Law. The information ratio is on center stage in the multifactor-modeling framework of Grinold and Kahn (1995). They proposed a "fundamental law of active management" based on an approximate decomposition of a theoretical maximum information ratio hypothetically achievable by the manager, IR_{max}, into two components—an information coefficient, IC, and the "breadth of the strategy," BR:

$$IR_{max} \approx IC(\sqrt{BR}). \tag{8}$$

IR_{max} is an *ex ante* measure based on the residual risk from a multifactor model. IC, the information coefficient, is the correlation between securities' actual returns and the active manager's forecasts of returns on those securities. Grinold and Kahn considered the information coefficient a measure of the manager's skill, or special information. BR, the strategy's breadth, is defined as the number of independent bets taken on forecasts of exceptional returns. Because IR_{max} is an *ex ante* theoretical construct, it has no direct correspondence with the *ex post* information ratio of Equation 4 except (roughly) as an upper bound.

Equation 8 is a useful expression of the synergy expected from turning the adage "work smarter, not harder" into the well-known variation "work smarter *and* harder." But the concepts have very specific meanings here: "Smarter" means making more-accurate forecasts, and "harder" means covering more securities or forecasting the same securities more frequently.[1]

The maximum information ratio of Equation 8 is central to the Grinold–Kahn framework because they claim that the maximum value that can be added by an active manager is proportional to the squared maximum information ratio:

$$\text{Potential added value} = \frac{IR_{max}^2}{4\lambda}, \tag{9}$$

where λ is the coefficient of risk aversion of the investor. A manager's IR_{max} determines the manager's potential to add value and is separate from the riskiness of the strategy. So, a manager with an IR_{max} of 0.5 serving a conservative investor with $\lambda = 0.2$ could, at most, deliver 31.25 basis points a year over the benchmark. Conversely, a manager with an IR_{max} of 1.0 serving an aggressive investor with $\lambda = 0.05$ could deliver up to 500 basis points a year over benchmark.

Substituting the fundamental law represented by Equation 8 into Equation 9 produces the following explicit relationship between skill, effort, risk-taking, and potential added value:

$$\text{Potential added value} \approx \frac{IC^2(BR)}{4\lambda}. \tag{10}$$

Because both IR_{max} and BR are difficult (if not impossible) to quantify, the Grinold–Kahn equations (8–10) are of limited operational value, but they do call attention to information ratios and information coefficients estimated from historical data as important indicators of an active manager's abilities. For most investors, an information ratio is more accessible than an information coefficient because information coefficients require detailed security-level forecasts that are usually proprietary to the manager.

The Sharpe Ratio and the Information Ratio

A statistic that is closely related to the information ratio but predates it is the Sharpe ratio. The original Sharpe ratio, also known as the Sharpe index, was introduced by Sharpe in 1966. This original version was tied to the theory of market equilibrium reflected in the capital asset pricing model. The theory implies the existence of a capital market line connecting the risk-free rate with the "market portfolio." The slope of the capital market line in risk–return space is the *ex ante* Sharpe ratio. Because the market portfolio is unknown, *ex post* performance measurement is based on the actual returns of the portfolio over the risk-free rate:

$$SR = \frac{\overline{R_P} - \overline{R_f}}{\hat{\sigma}_P}, \tag{11}$$

where $\hat{\sigma}_P$ is the standard deviation of the active portfolio's returns, sometimes referred to as the "absolute volatility." One well-known portfolio strategy is to pick the active portfolio that maximizes the Sharpe ratio.[2]

The literature on the exact relationship between the Sharpe ratio and the information ratio is confusing, to say the least. Sharpe himself created confusion in a 1994 article in which he asserted that the information ratio is a "generalized Sharpe ratio." This conclusion arises from a view of excess returns as the outcome from a long–short strategy. The original Sharpe ratio is, then, the special case of an information ratio when the risk-free asset is a shorted security; that is, funds are borrowed at the risk-free rate to finance the long portfolio. But that interpretation violates the concept implied by the name of the information ratio. The information ratio is intended to serve as a measure of the special information that an active portfolio reveals through its return. The Sharpe ratio, however, will generally be positive even if the returns to a passive index fund are used for R_P. What special information is contained in a passive index? Logically, the information ratio of any passive benchmark is zero.

An additional source of confusion is contained in the writings of those associated with the BARRA multifactor model. In the paper of Grinold (1989) and the textbook of Rudd and Clasing (1982), the Sharpe ratio is defined as the squared information ratio. The original source of this odd definition can be traced back to Treynor and Black (1973). Moreover, in Grinold and Kahn (1995), the traditional Sharpe ratio defined in Equation 11 reappears.

In summary, depending on what source you happen to pick up, you can see the Sharpe ratio defined as the slope of the capital market line, the squared information ratio, or a special case of the information ratio. The definition shown in Equation 11 appears to be the most useful for practitioners.

Information Ratios and *t*-Statistics

An information ratio is subject to substantial estimation uncertainty, especially when only a short history is available. Quantifying that uncertainty naturally leads to the question of an information ratio's statistical significance. A close connection exists between the statistical significance of excess returns and the statistical significance of an information ratio. Starting with a set of returns in excess of benchmark returns, suppose you wish to find out whether, on average, the set of excess returns is positive and statistically significant. Following standard hypothesis testing, you set up a null hypothesis that the manager's excess returns over benchmark are, on average, zero (or equivalently, less than or equal to zero). The alternative hypothesis is that, on average, the returns are positive. The usual statistical assumption is that the excess returns are normally distributed with a mean and variance that must be estimated.[3] A t-statistic is formed as the ratio of average excess return divided by the standard error of the average excess return:

$$t\text{-Statistic} = \frac{\overline{ER}}{\hat{\sigma}_{ER}/\sqrt{T}}. \tag{12}$$

The t-statistic has a t distribution with $T - 1$ degrees of freedom, and standard t-tables can be used to determine the outcome of the hypothesis test. If a t-statistic with, say, 20 degrees of freedom exceeds the 95 percent critical value of 1.725, you can conclude that the manager's excess return is positive, on average, with 95 percent statistical confidence.

The t-statistic of Equation 12 has a direct connection to the information ratio because IR is part of the t-statistic:

$$\begin{aligned} t\text{-Statistic} &= \frac{\overline{ER}}{\hat{\sigma}_{ER}/\sqrt{T}} \\ &= \frac{IR}{1/\sqrt{T}} \\ &= \sqrt{T}(IR). \end{aligned} \tag{13}$$

You can conduct a hypothesis test directly on the information ratio in which the same critical values of the t-tables apply.

The importance of statistical significance should not be overstated. An IR of 0.5 based on 21 time periods (20 degrees of freedom) will have a t-statistic of 2.29, which exceeds the 95 percent critical value of 1.725, indicating statistical significance. But the same IR of 0.5 based on 9 observations (8 degrees of freedom) will produce a t-statistic of only 1.50, falling short of the 95 percent critical value of 1.860 for 8 degrees of freedom. So, the IR is "significant" in one case and the same IR is "insignificant" in the other case, although they both represent the same value added. All statistical testing does is formalize how confident you can be in the calculated IR based on the length of history you have available.

This testing procedure can be extended to address the question of whether the information ratio exceeds a threshold or hurdle value (which some investors have, in fact, implemented for their hired managers). Suppose an investor has decided that all of its managers should have information ratios significantly in excess of 0.5. The t-statistic then becomes

$$t\text{-Statistic} = \sqrt{T}(IR - 0.5), \tag{14}$$

where the same critical values apply. If the calculated t-statistic exceeds the critical value of the t-table for $T - 1$ degrees of freedom, then the manager has beaten the 0.5 hurdle by a statistically significant amount. Note that the caveat on the importance of statistical significance also applies here.

Annualization

Information ratios are typically presented in an annualized form, which is intended to facilitate comparison. Annualized information ratios will differ, however, depending on how the returns were annualized. Of the many ways to annualize returns, the four most commonly used methods are considered here. The four methods are formulated for quarterly data to correspond to the data analysis of the next section. Modifications to monthly, weekly, or other data frequencies are straightforward. Throughout this section, the prefix A is used to designate annualized values, IR and ER represent, respectively, the quarterly information ratio and excess return, and subscripts 1 through 4 refer to the method.

1. Using the Arithmetic Mean Excess Return. The most common practice in the industry is to produce annualized statistics by multiplying the quarterly arithmetic mean by 4 and the quarterly tracking error by the square root of 4:

$$\overline{AER_1} = 4(\overline{ER}), \tag{15}$$

and

$$\hat{\sigma}_{AER_1} = \sqrt{4}(\hat{\sigma}_{ER}). \tag{16}$$

This method produces an annualized information ratio that is exactly twice the quarterly information ratio:

$$\begin{aligned} AIR_1 &= \frac{\overline{AER_1}}{\hat{\sigma}_{AER_1}} \\ &= \frac{4(\overline{ER})}{\sqrt{4}(\hat{\sigma}_{ER})} \\ &= \sqrt{4}(IR) \\ &= 2(IR). \end{aligned} \tag{17}$$

2. Using the Geometric Mean Excess Return. The geometric mean return is theoretically preferable to an arithmetic mean return because it takes into account the effects of compounding for a buy-and-hold investor. The annualized geometric mean excess return is found by solving[4]

$$\overline{AER_2} = \left[\prod_{t=1}^{T}\left(\frac{1+R_{Pt}}{1+R_{Bt}}\right)\right]^{4/T} - 1. \quad (18)$$

Typically, the same measure of volatility is used in the denominator of the information ratio as for the arithmetic mean, so

$$AIR_2 = \frac{\overline{AER_2}}{2(\hat{\sigma}_{ER})}. \quad (19)$$

3. Using the Continuously Compounded Mean Excess Return. Some analysts argue that working with continuously compounded returns has advantages over working with quarterly compounded returns (see Benninga 1997). The relationship between the two compounded mean returns is

$$\begin{aligned}\overline{AER_3} &= \ln(1+\overline{AER_2}) \\ &= \ln\left[\prod_{t=1}^{T}\left(\frac{1+R_{Pt}}{1+R_{Bt}}\right)\right]^{4/T} \\ &= \frac{4}{T}\left[\sum_{t=1}^{T}\ln(1+R_{Pt}) - \sum_{t=1}^{T}\ln(1+R_{Bt})\right].\end{aligned} \quad (20)$$

Because a continuously compounded return will be lower than either an arithmetic or quarterly compounded return, using in this method the same estimate for volatility as the two previous methods will always produce lower information ratios—in some cases, substantially lower.

A more sensible approach is to calculate a volatility measure based on deviations from the average continuously compounded excess return:

$$\hat{\sigma}_{ER_3} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left[\ln\left(\frac{1+R_{Pt}}{1+R_{Bt}}\right) - \overline{ER_3}\right]^2}, \quad (21)$$

and

$$\overline{ER_3} = \frac{1}{T}\sum_{t=1}^{T}\ln\left(\frac{1+R_{Pt}}{1+R_{Bt}}\right). \quad (22)$$

Then, the annualized information ratio is

$$AIR_3 = \frac{\overline{AER_3}}{2(\hat{\sigma}_{ER_3})}. \quad (23)$$

4. Using Frequency-Converted Data. Instead of annualizing directly from quarterly data, one can first convert the frequency of the data from quarterly to annual and then calculate the information ratio directly from the now-annual data.

The first step is to convert the frequency of the data from quarterly to annual. The theoretically correct way is to calculate the compound portfolio returns and benchmark returns separately (see Grinold and Kahn 1995). So, for the first year,

$$AR_{P1} = \left[(1+R_{P1})(1+R_{P2})(1+R_{P3})(1+R_{P4})\right] - 1,$$

$$AR_{B1} = \left[(1+R_{B1})(1+R_{B2})(1+R_{B3})(1+R_{B4})\right] - 1,$$

and

$$AER_1 = AR_{P1} - AR_{B1}$$

and for the second year,

$$AR_{P2} = \left[(1+R_{P5})(1+R_{P6})(1+R_{P7})(1+R_{P8})\right] - 1,$$

$$AR_{B2} = \left[(1+R_{B5})(1+R_{B6})(1+R_{B7})(1+R_{B8})\right] - 1,$$

and

$$AER_2 = AR_{P2} - AR_{B2},$$

and so forth. If j indexes the year and t is retained as the quarterly index, the general formula for the frequency-converted annualized excess return is

$$\begin{aligned}AER_j &= AR_{Pj} - AR_{Bj} \\ &= \left(\prod_{t=4(j-1)+1}^{4(j-1)+4}(1+R_{Pt})\right) - \left(\prod_{t=4(j-1)+1}^{4(j-1)+4}(1+R_{Bt})\right),\end{aligned} \quad (24)$$

with $j = 1, \ldots, (T/4)$.

The information ratio is then calculated on the basis of the annual excess return data:

$$AIR_4 = \frac{\overline{AER_4}}{\hat{\sigma}_{ER_4}}, \quad (25)$$

where

$$\overline{AER_4} = \frac{1}{T/4}\sum_{j=1}^{T/4} AER_j, \quad (26)$$

and

$$\hat{\sigma}_{AER_4} = \sqrt{\frac{1}{(T/4)-1}\sum_{j=1}^{T/4}(AER_j - \overline{AER_4})^2}. \quad (27)$$

Comparison of the Four Methods. Any one of these four methods of annualization has some validity, and perhaps a dozen other variations could be explored. An argument can be made that the frequency-conversion method is "best" because it provides the exact information ratio that would be calculated if returns were observed only annually. A practical drawback is that it requires four quarters of data for each year. If you want to update *IR* as new data come in each quarter, you have no easy way to do it.

Either of the compounding methods, AIR_2 and AIR_3, uses theoretically correct returns, but whether the measures of volatility used in the denominators are also theoretically correct is not clear. For example, AIR_2 (see Equation 19) uses the geometric mean in the numerator, but the measure of volatility in the denominator is based on deviations from the *arithmetic* mean.

An *IR* based on the arithmetic average returns is the most often used because arithmetic averages are the easiest to calculate and they usually approximate their theoretically superior cousins closely. Also, a transparent relationship exists between the *t*-statistic of Equation 13 and the arithmetically annualized *IR* of Equation 17 that does not exist for the other annualization methods. A question naturally arises, however, about whether systematic distortions are introduced by using Equation 13 instead of one of the other methods.

Given the returns of a particular fund for a particular observation period, can one say anything about whether the annualized information ratios calculated by the four methods will have a particular rank ordering? For example, will the frequency-converted *IR* always be larger than the arithmetic mean *IR*? The answer is that one cannot say anything with mathematical certainty about whether the information ratio found by one method will always be higher or lower than another one. This answer might at first seem counterintuitive, especially when the first method is compared with the second method. Equation 17 and Equation 19 have the same denominator, but the numerator of Equation 17 is based on the arithmetic mean return whereas the numerator of Equation 19 is based on the geometric mean return. The geometric mean is always less than the arithmetic mean if there is any volatility in the returns, so intuition would suggest that the solution to Equation 19 will always be less than the solution to Equation 17 for the same return history. But keep in mind that one method annualizes by multiplying the return by four whereas the other method takes the return to the fourth power, which removes any consistent ordinal relationship between them. So, the existence of any systematic differences among the annualization methods is an empirical question—which leads to the next section.

Empirical Evidence on Information Ratios

The empirical study reported here addressed (1) whether the choice among the four methods of annualization matters, (2) the effect of manager style on the distribution of information ratios, and (3) what kinds of information ratios real managers attain. The sample in the study came from the Frank Russell database and consisted of 212 active institutional money managers with quarterly returns spanning the 10 years from first quarter 1986 through fourth quarter 1995. Russell classified the managers in the sample as being in one of six style categories: market-oriented large-capitalization U.S. equities, large-cap value U.S. equities, large-cap growth U.S. equities, small-cap U.S. equities, international EAFE (MSCI's Europe/Australasia/Far East Index) equities, and sector-rotation U.S. bonds. Table 1 lists the benchmark indexes associated with the six styles and indicates the number of managers of the sample in each category.

The first question addressed was whether the choice of one of the four methods of annualizing the information ratio made any substantial difference in the overall distributions of the ratios. Surprisingly, extensive analysis produced only one systematic difference among the methods of annualization, namely, that the distribution of frequency-converted *IR*s (see Equation 25) had slightly thicker tails; that is, relatively more outliers resulted with this method than with the other methods.[5]

A clear finding of this study is that a manager's

Table 1. Style Benchmarks and Share of Sample

Category	Benchmark Index	Number of Managers
Market-oriented large-cap equity	Russell 1000	48
Large-cap value equity	Russell 1000 Value	35
Large-cap growth equity	Russell 1000 Growth	27
Small-cap equity	Russell 2000	35
International EAFE equity	MSCI EAFE	28
Sector-rotation bonds	Lehman Brothers Aggregate	39

information ratio should be judged relative to the manager's style universe. Table 2 contains statistics on the distribution of annualized information ratios, and Figure 1 contains relative frequency histograms of the data. These information ratios were all calculated using the arithmetic mean method of annualization. As can be seen, information ratios for the sample differed dramatically by style. As a group, small-cap managers added the most value over benchmark returns during this period; more than half the managers exceeded 0.4. International managers performed the worst, with not one manager breaking 0.2. Comparing information ratios among styles risks confounding manager skill with systematic and cyclical differences among styles.

Another issue is the sensitivity of information ratios to the chosen benchmark. The choice of benchmark is sometimes a matter of intense negotiation between manager and investor, and the benchmarks used here may be inappropriate for some styles. For example, many of the market-oriented managers may have been using the S&P 500 as a benchmark rather than the Russell 1000. Along similar lines, many small-cap managers have some mid-cap stocks in their portfolios, so the Russell 2500 might have been a more appropriate benchmark for that style universe. Figure 2 shows comparisons of relative frequencies for the market-oriented managers when the Russell 1000 was the benchmark and when the S&P 500 was the benchmark (top panel) and the small-cap managers when the Russell 2000 and the Russell 2500 were the benchmarks (bottom panel). Visual inspection makes clear that, as a group, market-oriented managers performed worse against the S&P 500 than against the Russell 1000 and small-cap managers, as a group, performed worse against the Russell 2500 than against the Russell 2000. The average drop in information ratios is 0.03 for market-oriented and 0.15 for small-cap managers when the alternative benchmarks were used. The maximum drops are 0.20 and 0.53, respectively. The choice of benchmark clearly matters a great deal in calculating information ratios and should be thoughtfully considered.

How high must a manager's information ratio be for the manager to be hired, and how low must it be for a manager to be fired? Grinold and Kahn (1995) asserted that an *IR* of 0.50 is "good," of 0.75 is "very good," and of 1.0 is "exceptional." They also reported that about 10 percent of all information ratios lie above 1.0. Jacobs and Levy (1996) suggested that a "good manager might have an *IR* of 0.5 and an exceptional manager might have an *IR* of 1.0" (p. 11). The authors did not say whether these numbers came from theory, empirical evidence, or practical experience.

So, the third issue this study addressed was how this experienced group of managers (a manager had to have at least 10 years of an unbroken return history to be included) measures up to the Grinold–Kahn criteria. Table 2 contains statistics on the portions of managers in the right tails of their respective style distributions, which allows an assessment of the abilities of the managers in the sample. If one accepts the Grinold and Kahn designation of an "exceptional" money manager as having an information ratio of 1.0 or better, then no managers in four of the styles and fewer than 3 percent of the managers in the other two are exceptional. No one in two of the styles measures up to their designation of a "good" manager ($IR > 0.5$). Considering that this sample is a data set of 10-year survivors, one would expect any bias in the distribution to be on the upside, so sustaining a high information ratio over a substantial length of time appears to be a tougher proposition than Grinold and Kahn suggested.

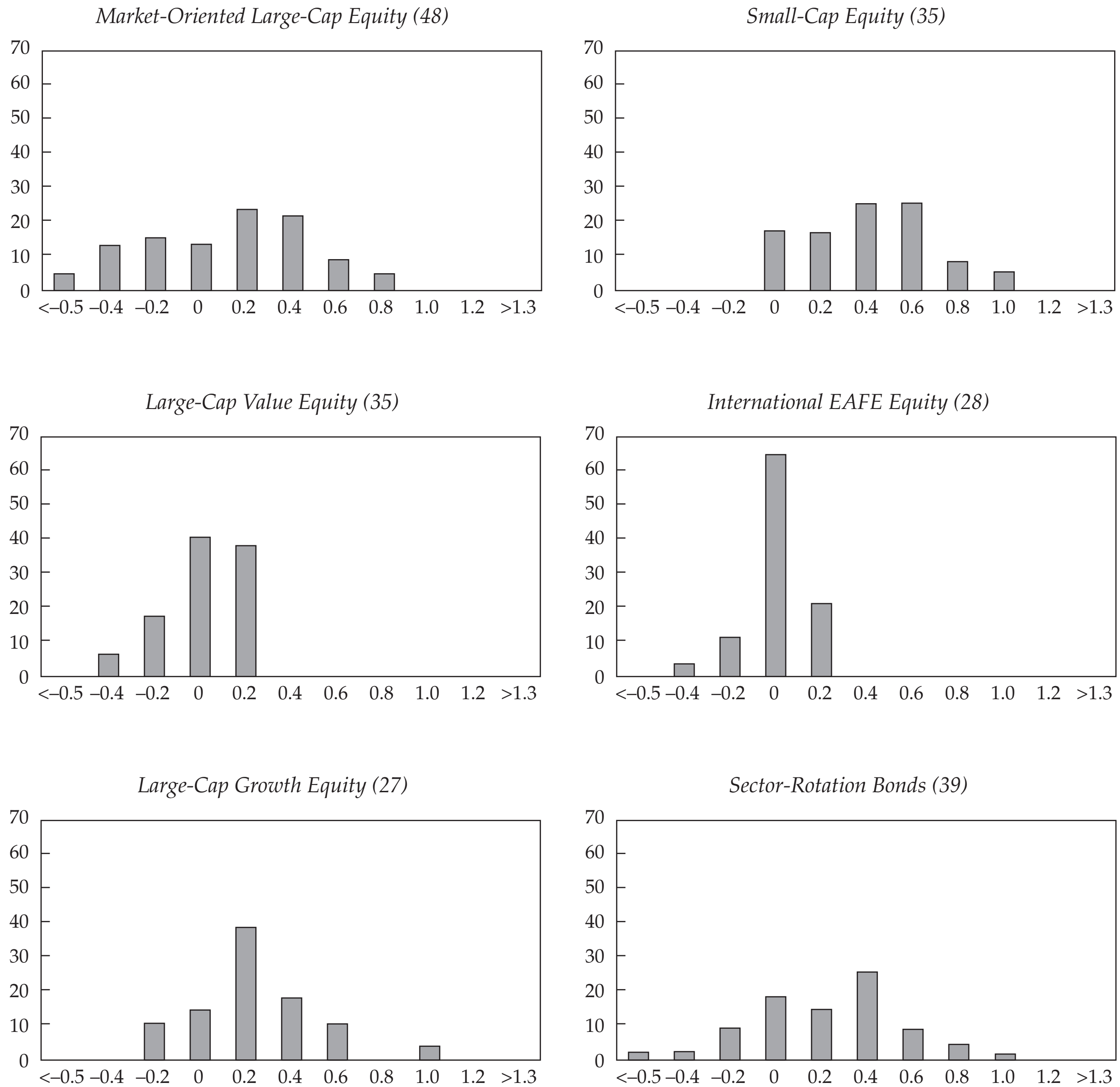
Caveats

Investors should keep two warnings in mind when assessing this empirical evidence on information ratios—one related to misusing the ratios to make

Table 2. Distribution of Annualized Information Ratios, First Quarter 1986–Fourth Quarter 1995

	Market Oriented	Value	Growth	Small Cap	EAFE	Sector Bonds
N	48	35	27	35	28	39
Maximum ratio	0.74	0.27	0.96	1.03	0.20	1.41
Upper quartile	0.40	0.16	0.34	0.58	0.08	0.48
Median	0.19	0.02	0.23	0.43	0.02	0.30
Lower quartile	–0.20	–0.08	0.11	0.17	–0.06	–0.02
Minimum	–0.68	–0.34	–0.24	–0.05	–0.33	–0.66
Mean	0.11	0.02	0.25	0.41	0.01	0.26
Standard deviation	0.37	0.17	0.26	0.29	0.13	0.39
Portion > 1.0	0.0%	0.0%	0.0%	2.9%	0.0%	2.6%
Portion > 0.5	12.5%	0.0%	14.8%	40.0%	0.0%	20.5%

Figure 1. Relative Frequency Histograms of Information Ratios: Six Styles

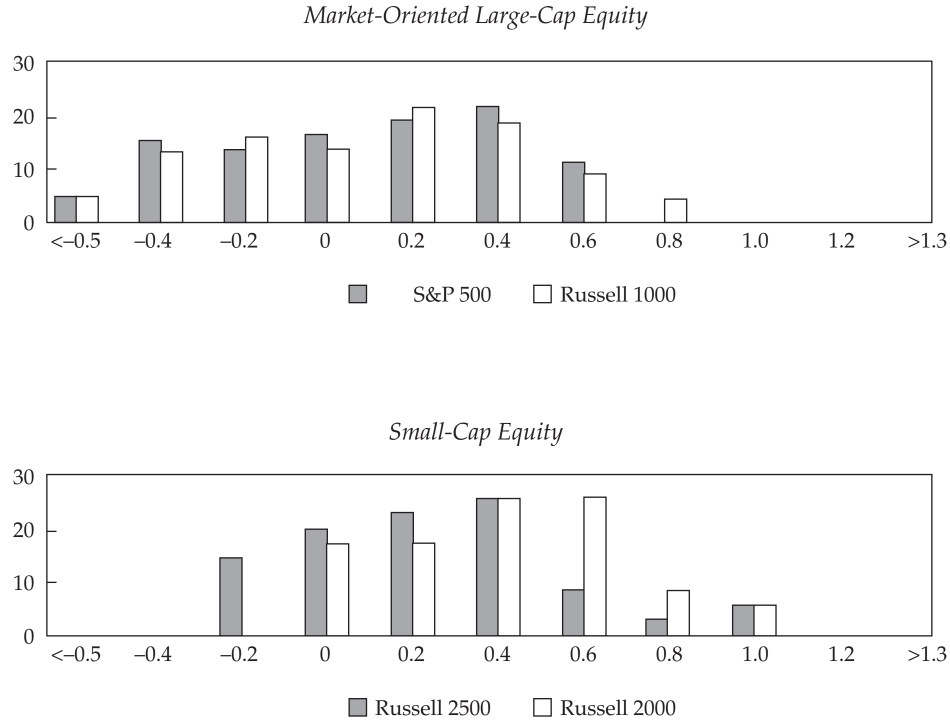


Note: Midpoints of ranges. Information ratios are on the *x*-axes; relative frequencies, in percentages, are on the *y*-axes.

asset allocation decisions, and the other related to misusing the ratios to make passive versus active decisions. As to the first caveat, the information ratio is not useful for making decisions about how much to allocate to a particular asset class or style. Suppose you calculate that the information ratio of your bond manager is 0.5 and the information ratio of your growth-stock manager is 1.0. Should you shift funds out of bonds and into growth stocks? The answer has to be: not without a lot more information. The information ratio does not contain any information on correlations between asset classes. Furthermore, it does not take into account the risk tolerance of the investor. The information ratio is most useful for measuring the performance of an active manager against an appropriate benchmark. It can be used as a guide to choosing an active manager within a universe of similar asset/style managers, but it is not useful for making asset allocations.

As to the issue of drawing any inferences from the empirical evidence about the passive versus active question, remember that one 10-year past period may tell you nothing about the future. Do the modest to poor information ratios of these active value and EAFE managers suggest that

Figure 2. Relative Frequency Histograms of Information Ratios: Market-Oriented Large-Cap U.S. Equity Using Two Benchmarks and Small-Cap U.S. Equity Using Two Benchmarks



Note: Midpoints of ranges. Information ratios are on the *x*-axes; relative frequencies, in percentages, are on the *y*-axes.

investors would be better off going passive in those styles? The answer depends on your assessment of whether style-specific cycles exist. If the opportunities for active managers to add value go through style-specific cycles, then it is entirely possible that value managers will be able to add substantial value over benchmark returns in the future while another style—small-cap managers, for example—is struggling.

Conclusion

The information ratio is a powerful tool for assessing the skill of an active manager. It is arguably the best single measure of the mean–variance characteristics of an active portfolio. But investors should never rely exclusively on any single measure. Moreover, as with any statistic based on historical data, a high information ratio in the past is no guarantee of a high one in the future, and vice versa. In addition, the information ratio can be manipulated. Although the choice of annualization method does not make a large difference in most cases, the choice of benchmark does—sometimes dramatically. You should always be cautious in interpreting a published information ratio, and you should discount any that uses an inappropriate benchmark.

Notes

1. In this interpretation, although working harder garners diminishing returns, being smarter never does.
2. See Ankrim (1992) for the pitfalls of this strategy.
3. Actually, the assumption that excess returns are normally distributed is not necessary. The important requirements are that the population mean and variance of excess returns exist and that the excess returns be independent. Then, the *average* excess return will be normally distributed (asymptotically) even if the excess returns themselves are not. In practice, an assumption of independence is usually more problematic than an assumption of normality.

4. A simpler approximation is often used: $\overline{AER_2} = \left[\prod_{t=1}^{T}(1 + ER_t)\right]^{4/T} - 1$. The result is usually quite close to Equation 18.

5. The various methods of annualization can, however, produce some large differences; of the 1,272 pairwise comparisons, the maximum difference was a huge 0.82. The average difference was less than 0.005, however, and the average absolute-value difference was only 0.05.

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