ADDING VALUE IN FUND EVALUATIONS

Alpha, Sharpe Ratio, and Information Ratio

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The debate over active vs. passive investing really comes down to one question: Can active managers really add value? If not, then markets are truly efficient and indexing is the best alternative. But if managers can consistently add excess value over and above index returns, then active strategies – at least with the best managers – are worth pursuing.

Despite the rapid growth of index funds and benchmark-tracking exchange traded funds (ETFs), active funds still far outnumber their passive counterparts. Arguments for passive investing have gained traction in recent years, yet most investors still seek the "best" funds with the "best" managers in hopes of beating the market. Statistical measures of managers' ability to add value have been developed to aid in this quest.

Three primary standards of value-added return are alpha, the Sharpe Ratio, and the Information Ratio. All three are related, but there are significant differences. Not only do the calculations differ, but so does the "value" each measures. These differences determine which statistic is the most appropriate under any given set of circumstances. The key is to recognize which is most fitting in your specific analysis.

Alpha

Alpha is a measure of the difference between an investment's actual returns and its expected return, given its level of risk as measured by beta. Beta is a measure of the volatility, or systematic risk, of an investment. It is the component of risk that is correlated to market movements, and which is not eliminated through diversification. This is the basis of the Capital Asset Pricing Model (CAPM):

$$E(R_a) = R_f + \beta_{am} (R_m - R_f) + \varepsilon \qquad (1)$$

Where:

- $E(R_a)$ = Expected Annualized Asset Return
- R_f = Annualized Risk-Free Rate
- R_m = Annualized Benchmark Index Return
- β_{am} = Beta Coefficient of the Asset Return Measured against Market Return
- ε = Error Term (generally minimal)

For mutual funds, $E(R_a)$ represents the fund's expected return. The risk-free rate is typically measured by the return on a 90-day Treasury bill. The market return is the return of the index benchmark. Beta is a measure of the fund's sensitivity to market movements, which can be expressed as:

$$\beta_{am} = \frac{Cov(R_a, R_m)}{Var(R_m)} \qquad (2)$$

If the covariance between the fund and the market (the numerator in Equation 2) exactly equals the variance of the market (the denominator of Equation 2) then $\beta_{am} = 1$ and the fund moves in lockstep with the market. When $\beta_{am} > 1$, the fund is more volatile than the market, and when $\beta_{am} < 1$ the fund is less volatile. Beta is an important component of this equation because one would expect funds with high betas (and therefore greater volatility) to have higher returns than the benchmark in up markets and lower returns in down markets. The exact opposite would be true for funds with low betas.

Now recall that alpha is defined as the difference between the fund's actual return and its expected return, given its level of risk as measured by beta. If a fund's actual return differs from the result of Equation 1, the difference is its excess return or alpha:

$$\alpha_a = R_a - E(R_a) \qquad (3)$$

Where:

α_a = Asset Alpha
$E(R_a)$ = Annualized Expected Asset Return
R_a = Actual Annualized Asset Return

When $\alpha > 0$, the fund's actual return exceeds its expected return, in which case the manager has added value. When $\alpha < 0$, the fund manager has actually destroyed value. When $\alpha = 0$, the fund has behaved exactly as predicted by the market and its beta to the index, but the manager has not added any value.

As you can see from Equation 1, the fund's return comes from two sources: the beta adjusted market component and alpha component. Presumably the return of the beta component can be replicated through the use of passive investments such as index funds or ETFs. The alpha component must come from the manager's security-picking or market-timing ability. Both are measured relative to "the market" so the choice of index to represent the market return (R_m) is critical. An index with a high R^2 to the fund is the best choice for this purpose. In most instances this would be a style and/or capitalization index representative of the fund's market niche. Broad market indexes may not display enough correlation to truly distinguish between market return and value added.

As an example, consider the 3-year statistics for a small cap growth fund as illustrated in Table 1. If alpha is calculated using the S&P 500 as the market measure, the fund has a high beta (1.53) and negative alpha (-2.86%). Based on this you would conclude this is a volatile fund and the manager has actually destroyed value. Investors would be better off in a passive S&P 500 index fund or ETF than in this fund. But this is a small cap fund with a significantly higher R^2 to the Russell 2000 Growth Index. Against that, the fund's alpha is a positive 2.36% and the beta is actually below that of the index. This suggests the manager has added value with below-average volatility – the exact opposite of the initial conclusion.

TABLE 1

	S&P 500	Russell 2000 Growth
R^2	70	89
Beta	1.53	0.80
Alpha	-2.86	2.36

Which is correct? They both are. They are both accurate applications of Equations 1 – 3 simply using different values for the market return (R_m). There are times when each may be appropriate. For example, if the goal is to find a fund to represent small cap growth in an asset allocation model, the category index (in this case, Russell 2000 Growth) would be the appropriate market proxy. On the other hand, if the goal was to find a good "all cap" fund, the S&P 500 could be more appropriate. As this example clearly illustrates, although we may think of it in absolute terms, alpha is a relative statistic, heavily dependent upon the market proxy. [i]

Sharpe Ratio

Introduced by William F. Sharpe[ii], the ratio that bears his name measures an investment's excess return per unit of risk. It is expressed as:

$$S_a = \frac{R_a - R_f}{\sigma_a} \qquad (4)$$

Where:

S_a = Sharpe Ratio of Asset
R_a = Annualized Asset Return
R_f = Annualized Risk-Free Rate
σ_a = Standard Deviation of Excess Returns

For mutual funds, the numerator in Equation 4 (R_a - R_f) is the annualized measure of the fund's return over that of the risk free rate. This is its excess return. In the denominator, standard deviation measures the volatility of the fund's excess returns. This is its risk. The Sharpe Ratio thereby quantifies excess return per unit of risk.

It differs from alpha in three significant ways. First, the Sharpe Ratio measures "excess return" versus the risk-free rate whereas alpha is based upon risk-adjusted return versus a specific benchmark index. It is not uncommon for a high-beta fund to have a positive Sharpe Ratio but a negative alpha.

Secondly, the Sharpe Ratio is not dependent upon a particular market proxy or index, only the riskless asset. Because of this, it can be used to compare funds' risk-adjusted returns regardless of their market segment. This makes it particularly attractive when comparing funds across styles, capitalizations, or markets.

Thirdly, the two measures handle risk differently. The alpha calculation adjusts the market return by beta, a measure of the asset's market related risk, but does not consider the risk associated with the excess return. The Sharpe Ratio doesn't separate risk into beta and alpha components, but instead is a measure of *overall* risk-adjusted excess return. It makes no distinction in the source of the risk.

Despite its simplicity, the Sharpe Ratio still requires careful consideration. The underlying concept is clear enough: Investors prefer greater return and lower risk. This suggests funds with higher Sharpe Ratios would always be preferred, but that is not always the case. For example, there are times – especially over the short term – when the Sharpe Ratio is negative. This happens when the fund's excess returns fall below the risk-free rate. Table 2 illustrates the problem. Here, Fund 2 has the higher Sharpe Ratio, but it also has a lower return and higher risk than Fund 1. The problem occurs because their returns are roughly the same, but Fund 2's standard deviation is considerably higher. When these figures are run through Equation 4, Fund 2 actually benefits from having a higher standard deviation since it reduces the negative result. Had the funds' returns been positive, the exact opposite would have occurred and the Sharpe Ratio would have favored Fund 1. Because of this problem, some analysts don't use the Sharpe Ratio when excess returns are negative. Others modify the formula by using the absolute value of the excess return in the numerator of Equation 4, always resulting in a positive Sharpe Ratio. The problem with this is the inability to make consistent comparisons to funds that actually have positive excess returns.

TABLE 2

	Fund 1	Fund 2
Fund Return	2.40	2.30
Risk Free Rate	2.50	2.50
Standard Deviation	10.2	21.8
Sharpe Ratio	-0.0098	-0.0092

Also consider the situation illustrated in Table 3. Based on the Sharpe Ratios, Fund 2 has the greater risk-adjusted return. But while its return is almost twice that of Fund 1's, its risk is more than double. The Sharpe Ratio shows that Fund 2 produces marginally more return per unit of risk, but a risk-averse investor may still reasonably prefer Fund 1. For this investor, the additional return does not justify the substantial increase in risk. Despite Fund 2's superior performance, the downside risk is too great. Standard deviation, the denominator in Equation 4, does not distinguish between upside and downside risk, it is simply a measure of overall volatility. Both of these examples suggest the Sharpe Ratio is best evaluated in the context of its components. In addition, a

TABLE 3

	Fund 1	Fund 2
Fund Return	8.13	14.81
Risk Free Rate	2.50	2.50
Standard Deviation	11.6	24.3
Sharpe Ratio	0.4853	0.5066

thorough fund evaluation would benefit from the inclusion of other, more specific, risk factors.

Information Ratio

Like the Sharpe Ratio, the Information Ratio also measures excess return per unit of risk:

$$IR_a = \frac{\overline{R}_a - \overline{R}_m}{\sigma_{ER}} \qquad (5)$$

Where:

IR_a = Information Ratio of Asset
$\overline{R}_a$ = Annualized Asset Return
$\overline{R}_m$ = Annualized Benchmark Index Return
σ_{ER} = Annualized Standard Deviation of Excess Return

Unlike the Sharpe Ratio, the Information Ratio measures excess return and risk relative to a specific benchmark index. For mutual funds, the numerator is the difference between the annualized returns of the fund and the annualized returns of the benchmark. The denominator is the standard deviation of the excess returns, also known as the fund's tracking error. Whereas the Sharpe Ratio divides excess returns over the risk free rate by the fund's overall risk, the Information Ratio compares the manager's excess return over the benchmark index to the additional non-market risk necessary to achieve it. Put another way, it is the risk and return trade-off of active management over the passive index. The higher the Information Ratio, the greater the risk-adjusted benefits of active management.

If the benchmark index is the risk-free rate represented by the 90-day Treasury bill, then the Information Ratio is simply a version of the Sharpe Ratio. But the 90-day Treasury bill is not the most appropriate benchmark for most funds, particularly equity funds. As with alpha, the Information Ratio is critically dependent upon the use of the correct market benchmark. In fact, it is often calculated using the fund's alpha to represent excess return:

$$IR_a = \frac{\alpha_a}{\sigma_{ER}} \qquad (6)$$

Where:

α_a = Asset Alpha
σ_{ER} = Annualized Standard Deviation of Excess Return

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To see why, substitute Equation (3) for the left side of Equation (1) and rearrange terms:

$$R_a = R_f + \alpha_a + \beta_{am} (R_m - R_f) + \varepsilon \qquad (7)$$

When $\beta_{am} = 1$, equation (7) becomes:

$$R_a = R_f + \alpha_a + R_m - R_f + \varepsilon$$
$$= \alpha_a + R_m + \varepsilon$$

Rearranging terms:

$$R_a - R_m = \alpha_a + \varepsilon \qquad (8)$$

When annualized, the left side of Equation (8) is the numerator of Equation (5). If, as assumed earlier the error term ε is small, substituting Equation (8) in to Equation (5) yields equation (6).

Although the Information Ratio is often calculated in this manner, results can differ significantly from those obtained from Equation (5). In general, the more the fund's beta differs from 1, the greater the difference. Funds with high betas tend to have lower alphas while the exact opposite holds for those with low betas.[iii] This can be observed from Equation (7) where, for any given level of fund return (R_a), an increase (decrease) in beta (β_{am}) will result in a lower (higher) alpha (α_a).[iv]

As was the case when estimating alpha, the calculation works best when beta is close to 1 and the benchmark index has a high R^2 to the fund. This assures that the benchmark's risk is a good proxy for the manager's systematic risk, allowing the Information Ratio to truly represent the manager's risk-adjusted value-added return. Like alpha, the Information Ratio is dependent upon the benchmark index used in its calculation.

The Right Measure

In general, alpha measures a fund's excess return relative to the appropriate benchmark. The Sharpe Ratio is a gauge of its total risk-adjusted return, while the Information Ratio is a measure of the fund manager's excess risk-adjusted return. Each can be appropriate depending on the goal of your particular evaluation.

Alpha and the Information Ratio measure value added relative to a specific benchmark index. Because of this, they should be used in conjunction with other statistics such as R^2 and beta to assure a close fit and meaningful results. They are most appropriate when evaluating specific market segments (e.g. small cap value rather than domestic equity) where all funds have the same capitalization or style index.

The Sharpe Ratio is not tied to any given market segment or benchmark index. As such, it can be used to compare risk-adjusted return of funds from across the broad market without regard to capitalization or style.

Alpha measures the overall value added by a fund over the benchmark index. It measures excess return given the level of market risk. It makes no adjustment for the risk associated with the additional performance. The Information Ratio measures the fund's *risk-adjusted* excess return relative to the benchmark. These can be informative statistics when searching for actively managed funds. Be aware however, that because both are measures of relative value-added return, these two statistics are highly correlated.

In contrast, the Sharpe Ratio makes no distinction in the source of a fund's risk or return. Instead, it quantifies its overall risk-adjusted return regardless of the source. Unlike alpha and the Information Ratio, it offers little insight into the manager's ability to add value over the index or the benefits of active versus passive management.

Table 4			
	Alpha	Sharpe Ratio	Information Ratio
Measure	Excess Return	Risk-Adjusted Return	Manager's Risk-Adjusted Return
Relative to Index	Yes	No	Yes
Uses	Within Category	Across Category	Within Category
Complimentary Factors	Beta, R-Squared	Standard Deviation	R-Squared

[i] Although investors often seek "absolute returns" and managers claim to "add alpha", both are relative concepts. For a detailed discussion of this, see M. Barton Waring and Laurence B. Siegel "The Myth of the Absolute-Return Investor." *Financial Analysts Journal*, March/April 2006, pp. 14-21.

[ii] William F. Sharpe, "Mutual Fund Performance." *Journal of Business*, January 1966, pp. 119-138.

[iii] For examples of this and its implications, see Robert Schmidt, Shane Finneran, and Christopher Armstrong, "Manipulating Portfolio Risk Statistics" *Pensions & Investments*, September 30, 2002.

[iv] The effects when $\beta > 1$ and $\beta < 1$ are not symmetrical. See Thomas H. Goodwin, "The Information Ratio." *Financial Analysts Journal*, July/August 1998, pp. 34-43.

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