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A Tracking Error Primer

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Understanding the dimensions of risk is critical to both constructing a portfolio and evaluating managers. The goal of this research brief is to provide a deeper understanding of one particular dimension of portfolio risk: tracking error.

One way to measure the risk of a portfolio is on an absolute basis – in other words, not in comparison to a benchmark. The most common measure of a portfolio's absolute risk is standard deviation, which measures the volatility of the portfolio's returns.

Portfolio risk is also frequently measured relative to a benchmark. Tracking error is a commonly used gauge of benchmark risk, and is closely associated with excess return. A portfolio's excess returns are simply the absolute difference between a portfolio's return and that of its benchmark. Technically, tracking error is the annualized standard deviation of a portfolio's excess returns. In practice, tracking error is a gauge of how consistently a portfolio outperforms, or underperforms, its benchmark. The lower the tracking error, the more closely the portfolio mimics its benchmark's performance. The higher the tracking error, the more the portfolio deviates from the benchmark.

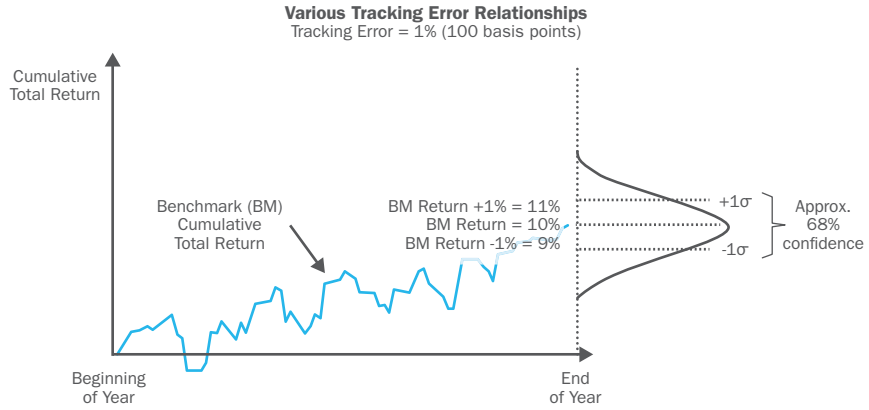
Tracking error is sometimes referred to as "active" risk, because it measures the active decision by the portfolio manager to veer from the benchmark's holdings and position weights. However, tracking error is not confined to traditional actively managed portfolios in which the portfolio manager attempts to add value through security selection or implementing tilts such as sector over- or underweights. Passively managed portfolios such as index funds and ETFs also exhibit tracking error for several reasons, including situations in which the fund does not hold all of the index's constituents in exactly the same weights as the index.

It is important to note that tracking error is directionally agnostic, in that it measures only the volatility of excess returns, and says nothing about the direction – positive or negative - of the return differential. Many investors mistakenly believe that higher tracking error equates to higher return potential, and this is not always the case. For example, a manager outperforming its benchmark by 5% each and every year would have the same tracking error - 0% - as a manager underperforming the benchmark by -5% each year. A worthy objective, of course, is to have low tracking error and positive excess returns.

Tracking Error Example

There is often confusion about how to interpret tracking error, particularly when it comes to application. Statistically, because tracking error is a standard deviation measure, if one assumes a normal distribution, about 68% of the time a portfolio's returns will fall within the range of the benchmark return +/- the tracking error. As an example, **Figure 1** nearby depicts a hypothetical 10% cumulative one-year return for a benchmark. If a portfolio has a tracking error of 1% to that benchmark, one would expect that 68% of the time the portfolio's return would fall within the range of 10% +/- 1%, or 9% to 11%. It is important to note that tracking error is not a percentage ***of*** the benchmark's return (i.e., not 1% of 10%, or 0.10%).

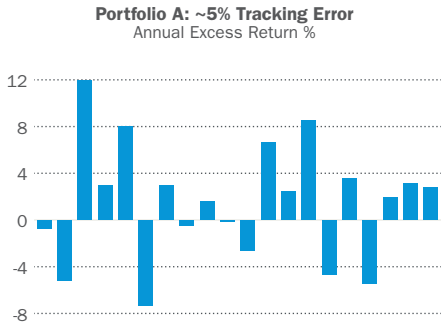
Figure 1:



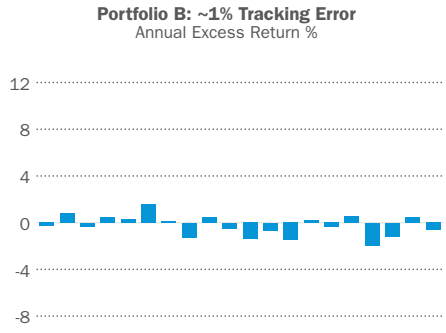
Source: PMC

Figure 2 below graphs annual excess returns for two levels of tracking error. Portfolio A is a manager with an annualized tracking error of approximately 5%; Portfolio B is a manager with annualized tracking error of roughly 1%.

Figure 2:



Source: Zephyr Associates



Source: Zephyr Associates

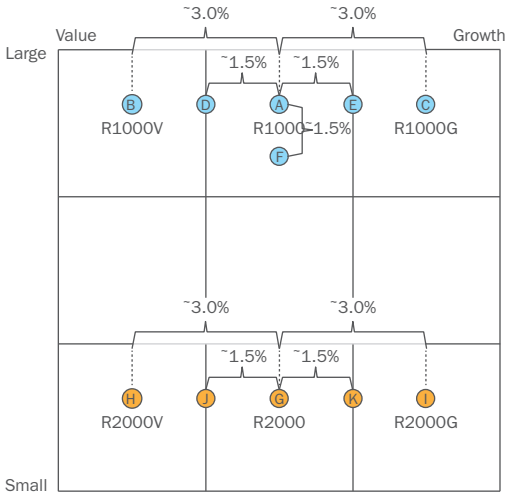
Is There an Optimal Level of Tracking Error?

While there is some evidence that for certain asset classes a modestly positive relationship exists between tracking error and active return, tracking error is typically not, in and of itself, a metric by which to select managers. Rather, it is best used in conjunction with other dimensions to determine whether a strategy is appropriate for a particular mandate. For example, tracking error plays a significant role in assessing various ETF options where adherence to the benchmark – i.e., lower tracking error - is paramount. Conversely, some active managers are less benchmark-aware and pursue strategies that inherently produce high tracking error.

In short, there are situations in which employing low tracking error managers is a reasonable strategy, and others where managers with higher tracking error would be better suited for the given objective. It may also be appropriate to combine low and high tracking error managers within the same overall portfolio, perhaps in a core/satellite approach. **Figure 3** below shows various tracking error relationships between indices.

Figure 3[1]:

Various Tracking Error Relationships
5-Year Annualized Tracking Error as of 10/31/13



Source: Morningstar

One issue to be aware of when evaluating managers is that as tracking error increases, so does the difficulty of determining a manager's skill. The fit of the benchmark drives the confidence one can have in the resulting performance statistics: the better the fit, the higher degree of confidence in the statistics. High tracking error is typically associated with lower r-squared, meaning the benchmark fit is not as tight. A low r-squared, usually accompanied by a high tracking error, reduces the validity of statistics such as alpha and beta.

[1] The graph shows the 5-year annualized tracking error as of 10/31/13 for various indices. Portfolio A is the Russell 1000 Index; Portfolio B is the Russell 1000 Value Index; Portfolio C is the Russell 1000 Growth Index; Portfolio D is a 50/50 blend of the Russell 1000 and Russell 1000 Value; Portfolio E is a 50/50 blend of the Russell 1000 and Russell 1000 Growth; Portfolio F is a 67/33 blend of the Russell 1000 and Russell Mid Cap index; Portfolio G is the Russell 2000 Index; Portfolio H is the Russell 2000 Value Index; Portfolio I is the Russell 2000 Growth Index; Portfolio J is a 50/50 blend of the Russell 2000 and Russell 2000 Value; and Portfolio K is a 50/50 blend of the Russell 2000 and Russell 2000 Growth.

Causes of Tracking Error

Several factors will create tracking error in either passively or actively managed portfolios. In the case of ETFs, where minimal tracking error is critical, there are several dimensions that can have an impact, including: (1) Expense ratio - expenses cause tracking error, since indices typically used as tracking benchmarks do not include fees. ETF sponsors try to keep expenses as low as possible in an effort to minimize tracking error; (2) Execution – efficient transaction execution within the ETF portfolio reduces tracking error; and (3) Optimization – ETFs will often hold only a subset of the benchmark's constituents, and the optimization process for constructing the concentrated portfolio will normally result in tracking error.

Active managers also experience tracking error for additional reasons: (1) Security selection – even active managers who control benchmark risk may hold positions that are not part of the benchmark; (2) Factor tilts – active managers may implement biases toward certain factors such as value, small cap and sector over-/underweights; and (3) Cash management – in order to accommodate cash flows, most active managers will hold at least a small portion of cash in the portfolio.

In a portfolio context, some of the causes of tracking error in individual managers can be diversified away so that the tracking error of the overall portfolio is reduced.

Estimating Tracking Error

There are two primary ways in which tracking error is used. First, trailing active return data provides an efficient historical analysis of a manager's tracking error through time. When used in combination with other statistics, historical tracking error is useful for evaluating a single manager or comparing multiple managers. Analyzing tracking error on an ex post basis is often helpful in gaining a general picture of the level of benchmark risk control a manager may employ in the future.

A second use of tracking error is on a forecast, or ex ante, basis. Quantitative portfolio managers, in particular, are focused on managing forecast tracking error, and usually employ some type of risk model to do so. A risk model is a sophisticated statistical means of identifying the various common factors determining stock price movements.[2] Some of the factors often used in risk models include exposures to style (i.e., value or growth), market capitalization, leverage and momentum. Managers will aggregate the various exposures for a benchmark's constituents, and construct a portfolio having the desired forecast exposure "tilts" and tracking error relative to the benchmark.

Conclusion

While it is sometimes misapplied, tracking error is an effective and widely used measure for understanding the benchmark risk of a manager. For general manager evaluation purposes it is best used in conjunction with other metrics to give a complete picture of the overall characteristics of the portfolio. Tracking error is also used by ETF sponsors and other quantitative managers to keep the portfolio's risk factor exposures and return profile at the desired level relative to the benchmark.

[2] Popular risk models include the Fama/French three-factor model, as well as commercial offerings from firms such as MSCI Barra. Institutional managers often develop their own proprietary model. PMC uses Tamarac's risk model.

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