

*Does Tracking Error Matter?*

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As the markets have gotten more volatile, and a number of hedge funds and a range of 'alternative' investment strategies have generated substantial losses, it is a very good time to think about tracking error and what it means. In portfolio management, tracking error refers to the divergence in performance between a portfolio or strategy and its benchmark. If an S&P500 fund diverges from the S&P500, you have tracking error. Mutual fund managers often worry about tracking error because they do not want to be judged as having under-performed their benchmark. If a fund can reasonably be expected to closely track a benchmark index, tracking error is useful. On the other hand, there are many portfolios that are not designed to track a benchmark index---often that is specifically the goal. Excessive focus on tracking error by investors or fund managers is ultimately likely to lead to less-than-ideal decisions.

I have written a number of articles about low-Beta / low-R<sup>2</sup> investing strategies. The basic idea is that it is quite simple to design a portfolio that specifically does not track the market well:

<http://seekingalpha.com/article/37280>

Beta measures the degree to which your portfolio amplifies or damps swings in the market and R<sup>2</sup> (also called R-squared) shows the degree to which a portfolio's movements can be explained by moves in the broader market. A low-Beta / low-R<sup>2</sup> portfolio tends to respond weakly to market moves and has much of its volatility caused by factors other than the market as a whole. This is desirable if you do not want your portfolio to be driven by the ups and downs of the market. This does not mean that a portfolio is low-risk, however---it just means that the portfolio is not driven by the market's moves. This kind of portfolio will not track any particular index. A challenge for investors with such portfolios is to figure out how to think about benchmarking.

The reality is that many portfolio designs are going to take a long time to be vindicated in terms of a high level of confidence that the portfolio is superior. This is particularly the case for a portfolio that is designed not to track a market benchmark. To demonstrate this, I have created a fairly simple example. We have designed a portfolio that is projected to out-perform the S&P500 in terms of both absolute return and with lower

volatility. The actual holdings of this portfolio do not really matter for the purposes of this example.

	Average Annual Return	Standard Deviation in Annual Return	Beta	R <sup>2</sup>
S&P500	8.3%	15.0%	100%	100%
Portfolio	11.8%	13.1%	66%	60%

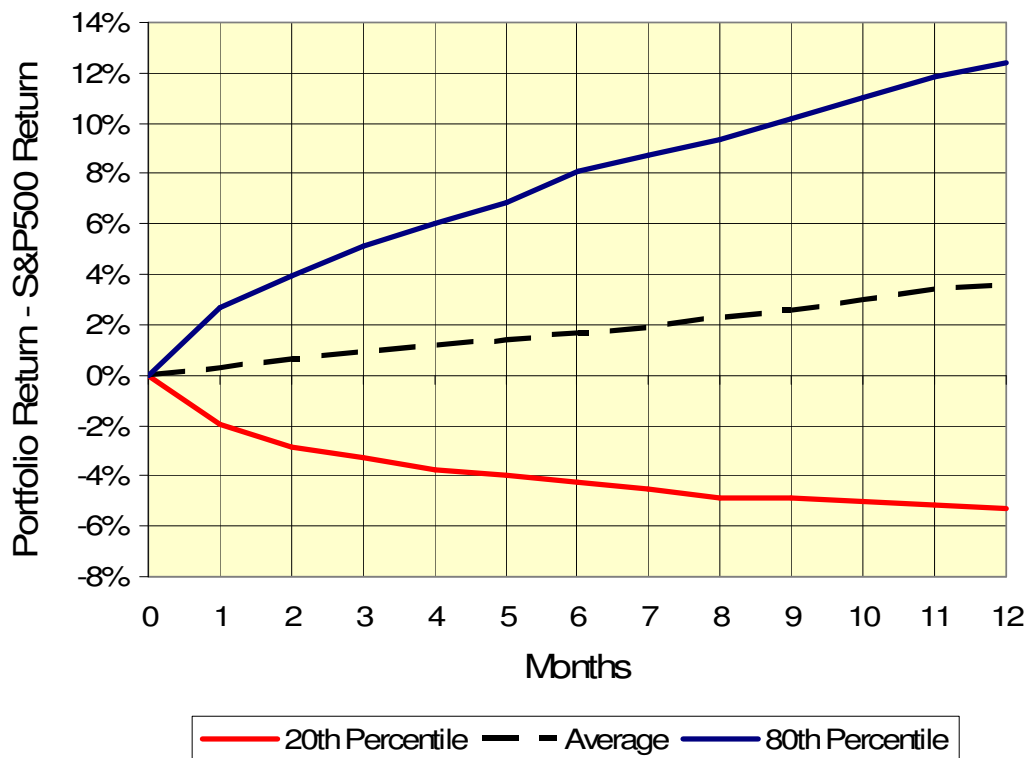
### *Portfolio statistics*

The S&P500 is projected to return 8.3% per year, with a standard deviation of 15%. By definition, Beta is 100% and R<sup>2</sup> (R-squared) is 100% for the S&P500. For our *Portfolio*, we project that the average return is 11.8% per year, with standard deviation of 13.1%. In other words, this portfolio is projected to beat the S&P500 by 3.5% per year—and with lower volatility. The R<sup>2</sup> of 60% means that only 60% of the variability in returns generated by this portfolio can be explained by moves in the broader market. Let's imagine that you have this portfolio and that these statistics are perfect – our projections are totally correct (though, of course, they never are). How long does it take for this portfolio to be guaranteed to soundly beat the S&P500? Also, how likely is it that this portfolio will under-perform the S&P500 for some period of time? These are important questions. The idea for this discussion came from a user of Quantext Portfolio Planner (QPP) who had designed some low-Beta / low-R<sup>2</sup> portfolios and had found that some had fared as poorly (or even worse) than the S&P500 during recent months in which the S&P500 has declined.

Before diving into the analysis, it is worth thinking about tracking error and what it means. First, have a look at the portfolio statistics shown above. From the perspective of portfolio theory and basic probability, there is no question that a rational investor will prefer this portfolio to an investment in the S&P500. Tracking error is a meaningless measure when comparing our model portfolio to the S&P500 in terms of which one a rational investor would choose. On the other hand, it is human nature to be concerned if our investment portfolios are behind the S&P500 over some period of time. This is an interesting behavioral finance issue.

In order to shed some light on how much tracking error we might experience in the portfolio for which I showed statistics in the earlier table, I have performed some analysis. I have taken the hypothetical low- Beta / low- $R^2$  portfolio (hereafter just called *the portfolio*) and generated simulations to show the probability that this portfolio will beat or under-perform the S&P500 within some period of time. As I said, a rational investor would choose the sample portfolio over the S&P500 (all other things being equal), but it always concerns investors if their chosen strategy lags the market for some period of time.

The chart below shows the difference in cumulative return between our sample portfolio and the S&P500 as a function of time horizon, accounting for the correlation between them. The dashed black line across the chart shows the average difference. As expected, the average spread between our better portfolio and the S&P500 grows over time—ending at 3.5% at the end of twelve months—just as the statistics say.



*Spread in performance between portfolio and the S&P500 over time*

If you invest in this portfolio and end up 3.5% ahead of the market after a year, you are happy and feel that your strategy is vindicated. The problem, however, is that the portfolio is better in a statistical sense—the odds are in your favor—but this outcome is just the average. The red curve that heads downwards is the 20th percentile outcome—your worst 2-in-10 outcomes. After a year in the portfolio, you have a 20% chance of having a return that is -5.3% relative to the S&P500 (the 20<sup>th</sup> percentile is -5.3%). If the S&P500 generates 10% in this case, your portfolio ends up generating 4.7% for the year. Can you live with a 20% chance of being 5.3% behind the market after a year if your expected (i.e. average) outcome is to be beat the market by 3.5%? On the other side of the chart, you have a 20% chance of chance of beating the S&P500 by 12% for the year (the upper blue curve, the 80<sup>th</sup> percentile). Over time, the average gains in the portfolio shifts the probable outcomes inexorably upwards vs. the S&P500, but you have the possibility of under-performance in any period of time.

### *Discussion*

There are many fund managers and investment advisors who would choose simply to invest in the S&P500 rather than the better portfolio shown here simply because they have a strong incentive not to end up with tracking errors. It is quite common to find ‘active’ fund managers who are ‘closet indexers,’ which means that they are ultimately building portfolios that are essentially index funds. Managers often end up here because they believe that they will be compared to the index performance and do not want to be found lacking. Investors in active funds who are wedded to the idea of benchmarking as the primary tool for judging their portfolios are likely to end up with sub-optimal investments simply because they are looking for better results while effectively tying the hands of their advisors.

While benchmarking is important, overly-simplistic benchmarking is a bad idea. Investors will do well to learn to live with ‘tracking error’ in their portfolios if the portfolio strategy is predictably likely to end up with tracking error. Over long periods of

time, the sample portfolio is a far better choice---and an educated investor will benefit by learning to live with the tracking error.

In market conditions in which the broad market conditions look unfavorable, a low-Beta / low- $R^2$  portfolio is one option for decoupling a portfolio from the broad market swings. I have written about this type of portfolio strategy on a number of occasions. It is crucial that investors who consider such strategies understand that such a portfolio has some probability of lagging the market for some period, by the very nature of its design.

The primary take-away from this discussion is that the whole concept of tracking error must be used with some caution. A rational long-term investor would prefer the sample portfolio to investing in the S&P500, all other things being equal. A fund manager who wants to minimize the possibility of tracking error with respect to the S&P500 might not consider this portfolio preferable to closet indexing, however, because his interests are far more short-term: his fund will not attract new funds if he under-performs the benchmark. There is no place in portfolio theory that suggests that investors are better off by minimizing tracking error—and investors would do well to remember this.

*Quantext Portfolio Planner is a portfolio management tool. Extensive case studies, as well as access to a free extended trial, are available at <http://www.quantext.com>*

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