Rebalancing Risk and Portfolio Tranching

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Randomness is a way to understand deterministic features of the world

Rebalancing Risk Is Everywhere

Most investment professionals likes to think of their investment process as a deterministic outcome not affected by luck or randomness. However, very often the difference between hired or fired managers is in fact due to pure randomness. Rebalancing risk is one of the most overlooked biases within investing and it arises from the specific choice of <u>when</u> to rebalance. By neglecting to account for this random component inherent in any strategy investors are unable to both evaluate historical performance and running the risk of not realizing the true potential of their strategy.

The choice of when to rebalance a portfolio is often conveyed to convenient calendar dates like the first or last trading days of the month, quarter or year. However, one or two days offset in rebalancing dates between otherwise identical strategies can produce hundreds of basis points in performance difference, and if not counted for, investors can have no expectation that these differences will mean revert over time.

Outline

Rebalancing risk affects tactical, strategical, smart beta, and discretionary portfolios alike. Here we test the effect on a simple momentum based tactical model on stocks and bonds. We create offset portfolios, and highlight the difference in performance between different offset portfolios over time. We then introduce the concept of portfolio tranching. These are a collection of portfolios running identical strategies with an identical rebalance frequency, but rebalancing on unique days. The variance in total return profile between these offset portfolios highlights the impact of timing luck and is derived as the deviation from the long-term expected strategy return entirely as a result of when a portfolio is rebalanced. Finally we show that an equal-weight "portfolio-of-offset-portfolios" minimizes the impact of timing luck on the simple momentum model example.

**The Problem and The Solution**

Asset management due diligence is scrutinizing everything in between the methodology of stock selection and portfolio construction to the qualifications of the people designing and executing that process. Process due diligence usually starts with high-level investment philosophy and works down to portfolio execution decisions.

The date upon which most portfolios rebalance often converges to standard calendar time windows like weekly, monthly, quarterly, etc. Strategies then usually rebalance on the first or last days of these periods. However, robustness testing around this selection is infrequent at best and the choice of rebalancing date can have a massive impact on the total return profile of any strategy.

The investor has two solutions available: 1) Verify that long term performance is unaffected by the choice of rebalancing date and accept to live through any short/medium term low-performance realization due to a specific rebalancing choice. 2) Utilize the concept of portfolio tranching in order to minimize rebalancing risk and realize the true long term expected mean performance of the strategy.

Quantifying Rebalancing Risk

Below we show an example of solution 2 and show how even low granular portfolio tranching can minimize the rebalance risk, or timing luck. The plot shows 5 realizations of the same simple 200 day momentum strategy, rebalanced monthly and applied to stocks and bonds. The only difference is their exact rebalance day of the month and we therefore refer to them as offset portfolios. Each of the offset portfolios is rebalanced at the start of each month, but portfolio 1 rebalances on the 1st trading day of each month, portfolio 2 rebalances on 2nd trading day, etc. The variance in total return results among the offset portfolios is demonstrated in the equity curves below:
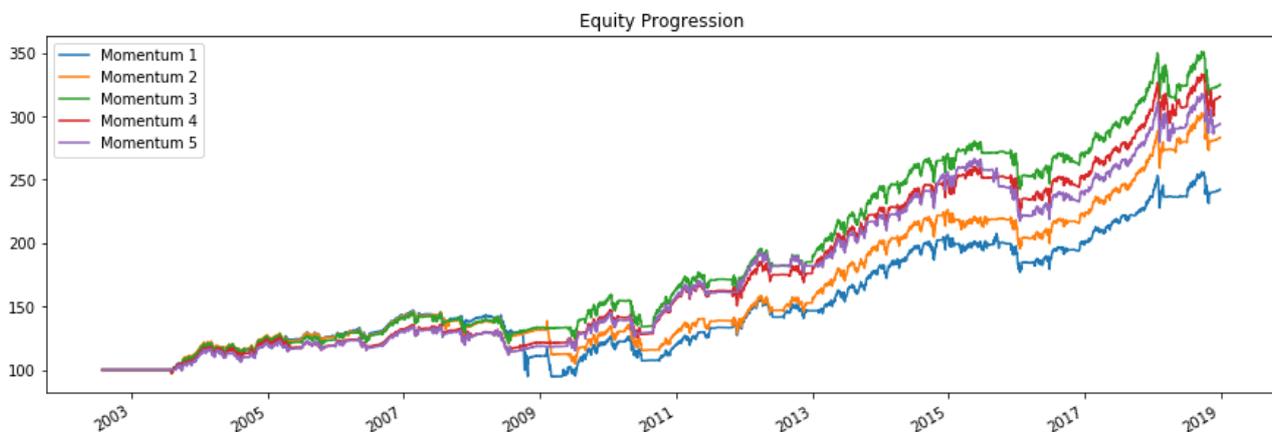
The total <u>annual return difference</u> between the best and worst offset portfolio is 200 basis point and the variance in total returns above is dependent entirely on when certain market events occurred within a given period. Consider the scenario where the market sells off at the last trading day of the month, causing stocks to exhibit lower momentum than bonds, only to recover shortly thereafter at the beginning of the next month. In this scenario, only those strategies rebalancing before the recovery would be affected by the whipsaw. The remainder would passively ride out the turbulence.

Portfolio Tranching

Using our prior 200 day momentum tactical timing model example, we can test the impact that tranching has on total return. Instead of choosing just one of the offset portfolios, running the risk of choosing a "bad" rebalance day associated with lower future performance, we can choose to allocate our capital equally across all the offset portfolios. By rebalancing 1/5 of the total portfolio on each of the first 5 trading days we mitigate any significant deviation from the set average. Basically by diversifying when we rebalance, we take advantage of diversification along a dimension rarely used by investors.
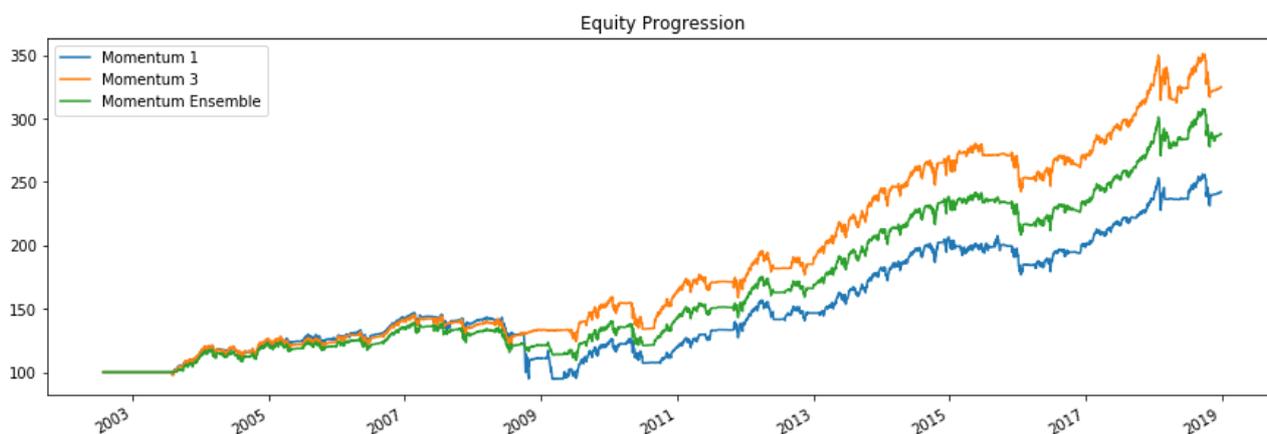
By using an ensemble approach to rebalancing we can realize the true potential of our strategy and highten the trust in historical performance being realized in the future. In fact, the ensemble strategy realizes the same Sharpe Ratio as the best offset portfolio over the period, without having to guess about the best day to rebalance at the start of the backtest. Further more, with todays advances in portfolio construction tools, the task of doing more advanced rebalancing need not be associated with any higher workload to the asset manager.

Ultimately, unless accounted for, results demonstrated on both a back-tested as well as a live basis may be massively skewed by this factor. The effects are so powerful that two managers, following identical strategies, may have markedly different performance results over time. One may be bestowed with praise for their alpha-generating abilities and the other may be fired for perceived underperformance, based solely on a rebalance date. For many asset managers, timing luck may be the hidden factor that leads to the difference between hired and fired.

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