The Case for SMART Rebalancing
by Arun Muralidhar and Sanjay Muralidhar

EXECUTIVE SUMMARY
- Once investment managers establish a long-term strategic allocation or benchmark, fund managers must decide how to manage the fund's ongoing allocation.
- Daily market movements can result in constant drifts of actual portfolio allocations from the strategic benchmark.
- Traditionally, experts advised "static rebalancing" wherein simple rules bring the allocations back to the benchmark if some allocation limit is breached or some calendar date is reached.
- Static rebalancing strategies are risky, as the investors take an implicit bet to be either long or short an asset without really focusing on the view on the markets.
- While static rebalancing is often better than drift, this article describes how SMART (Systematic Management of Assets using a Rules-based Technique) can be a better tool for investors.
- By using market factors and managing allocations proactively within rebalancing ranges (i.e., no change in overall policy), investors can improve performance and risk management.
- SMART rebalancing is essential for good governance.

BACKGROUND

Every fund manager has to deal with a vexing issue—namely, how to manage the rebalancing process as the returns from this activity impact the total portfolio performance. There is a wealth of information on these strategies, and many papers have been written on this topic.[1] Nersesian (2006) does an excellent job of introducing a process to help determine the ideal rebalancing policy and examine the considerations in selecting the appropriate approach. Most rebalancing policies (periodic, range, or threshold) first focus on minimizing the tracking error or absolute standard deviation of the portfolio as the key measure of risk (either directly or by targeting the highest Sharpe ratio), and then attempt to manage the trade-off relative to the transactions costs that more frequent rebalancing generates.[2]

Many portfolio managers manage their asset allocation decisions by adopting a rebalancing policy which typically involves returning the asset allocation to the target allocation or strategic asset allocation (SAA) at calendar intervals (monthly, quarterly, or annually). Alternatively, portfolio managers may use a "range-based" approach whereby the trigger points or ranges are typically 3–5% from the target, based on the volatility of asset classes. Variations of this approach rebalance to somewhere within these allocation ranges or use periodic cash flows to move the asset allocation of the various assets closer to what a rebalancing action would attempt to do. Often these approaches are a move toward a practical maintenance of the strategic weights, trading off between managing transactions costs and tracking error relative to the benchmark. These approaches can be called "static rebalancing" because the limits are set. However, the portfolio still drifts within the bands, as most policies are silent about what actions staff should take within the bands. This is demonstrated in Figure 1.

THE ALLURE OF REBALANCING

Rebalancing is attractive because it is simple to understand and to execute, is explicit and transparent, allowing portfolio managers to put in place the exact policy to be followed and be assured that it is being followed, and avoids the appearance of "do-nothing" or "buy-and-hold." Furthermore, discipline provides a decision regime that can be modeled to quantify the historical risk and return profile. Finally, most analyses suggest that a rebalancing policy is better than doing nothing (or letting the portfolio drift), and that has been good enough for most investors.

THE PROBLEM WITH STATIC REBALANCING

Despite the low tracking error relative to their benchmarks, static rebalancing policies can be problematic owing to the large absolute and relative drawdowns (or declines in the value of the fund). Therefore, when US and European equity declined dramatically from 2000 to early 2003, rebalancing would have done little to reduce the pain of the portfolio and would have caused the rebalanced portfolio to plummet as well. While static rebalancing is attractive in up markets, the analogy in down markets would be to tying your leg to the anchor of a sinking ship.

The larger questions that this article addresses in the new rebalancing paradigm are:

- What are the appropriate performance and risk measures in determining the best asset allocation approach? Additional risk measures like the drawdown in the portfolio (maximum decline in the absolute or relative value of the fund), and success ratio (number of months that you outperform the benchmark) are utilized as these better capture the concept of practical portfolio management risk as opposed to standard deviation. After all, a low tracking error relative to a benchmark may be worthless if the fund is bankrupted by a large drawdown in absolute value.
- Is there a better way to manage asset allocation decisions than static rebalancing?
- Can other approaches preserve the advantages that rebalancing policies

Figure 1. The implicit bet in traditional rebalancing policies
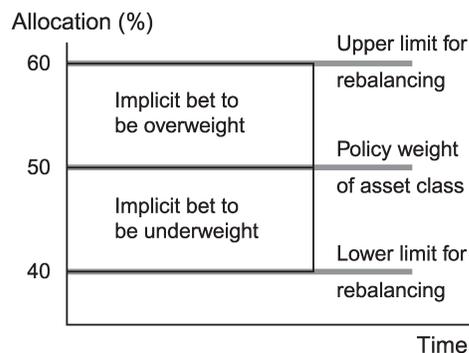
have, namely the ability to have explicit, transparent, and disciplined asset allocation decisions?

INFORMED OR SMART REBALANCING

The more sensible way to make asset allocation decisions is by a process called "informed rebalancing." Informed rebalancing is simply about making asset allocation decisions among the various assets in a portfolio to take advantage of the higher returns in the attractive assets, while underweighting the less attractive assets commensurately. The case for informed rebalancing was made very successfully in Muralidhar (2007), though McCalla (1997) had hinted at a somewhat different approach. This is done by identifying the factors that affect which assets in your portfolio will perform well and which will perform poorly during any given regime/cycle/period. This approach, therefore, involves the following steps:

- Identify all the asset allocation decisions being made in the portfolio.
- Develop investment rules to guide the desired asset allocation tilts in the portfolio. These rules will define the assets that should be overweighted or underweighted relative to the target allocation based upon the levels of certain market or economic factors, typically sources from finance or academic journals. These factors will be measures of valuation (whether an asset class is over- or undervalued), economic activity (different economic conditions favor different asset classes), seasonality, momentum, market sentiment (volume, volatility, risk aversion, fund flows, etc.).
- Quantify the historical performance of such an asset allocation approach to understand the risk/return profile of each factor model and possibly fine-tuning the selection of the various factor-based rules to ensure that they meet the investment objectives or constraints.
- Combine many such factor-based rules into a diversified strategy that provides a net indication of the relative attractiveness of each asset class so that risks of making decisions on a single economic factor are mitigated.
- Implement these asset allocation recommendations in a disciplined way (just as one would with static rebalancing). There are a number of ways to carry out such implementation that will be discussed separately.

For simplicity, we term this rules-based systematic approach as SMART rebalancing (systematic management of assets using a rules-based technique).

ADVANTAGES OF SMART REBALANCING

The SAA is normally derived from one of two types of optimization. The first method models assets and liabilities (ALM) to find the long-term asset allocation that has the best chance of meeting the liability (in the case of an individual, this would be the desired retirement income) requirement. The second method uses a mean-variance approach that makes assumptions of future asset returns and risk (often based upon historical performance) and finds an "efficient frontier" asset allocation with the highest return for an acceptable level of risk or the least risk for a given required return.

The attendant shortcomings of these optimizations aside—the most glaring being the need for an assumption of expected return/risk—this allocation is to be interpreted as the target allocation that over a very long period offers the best chance of meeting the fund objectives expressed in return/risk or funding terms. There is nothing in these mean-variance optimizations that reacts to market conditions in intervening periods. Again, to use a sailing analogy, naïve rebalancing is

CASE STUDY
Analysis of Buy-and-Hold, Static Rebalancing and SMART Rebalancing

A simple case study indicates how a hypothetical portfolio, highlighted in Figure 2, could be managed using such investment rules. We assume a simple portfolio with a strategic investment in four core assets: US Equity (benchmarked to the S&P 500), International Equity (benchmarked to the MSCI EAFE Index), US Fixed Income (benchmarked to the Lehman Brothers Composite Index) and Commodities (benchmarked to the Goldman Sachs Commodity Index). Rules are developed for each set of assets using multiple factors and are combined to create a diversified strategy to manage the allocation across these assets. The performance of this informed rebalancing portfolio is compared with a simple buy-and-hold option and a quarterly rebalanced portfolio. The portfolio target assets and allocation are shown in Table 1.

Further, this analysis was backtested over the period from January 1990 through October 2008, so that it covers a few different market regimes, the technology boom of the late 1990s, the subsequent correction of the early 2000s, the subsequent bull market post-2003, and the more recent decline through 2008. We include transactions costs of 20 bps round trip for all assets, though actual experience suggests much lower costs are incurred.
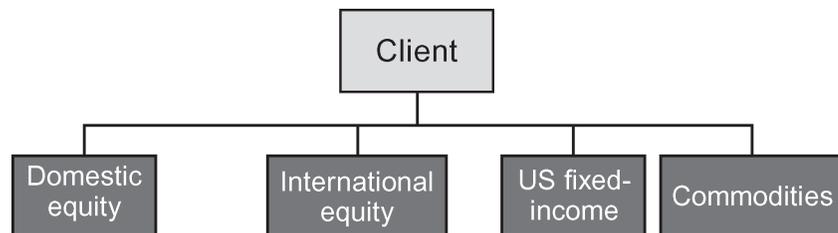
The performance analysis is restricted to a few key metrics in Table 2 in order to facilitate this discussion, but these results are confirmed over a broader set of risk and return parameters.

As indicated in Table 2, the range rebalancing alternative represents a meaningful improvement over the buy-and-hold strategy and is consistent with most prevailing studies. However, when compared with SMART rebalancing, the only advantage of range rebalancing is a slightly lower standard deviation. However, the lower standard deviation, which is what most professionals use as a proxy for risk, comes at the expense of a 0.5% lower annualized return and therefore a return/risk ratio of 0.67 versus 0.79 for the SMART rebalancing! Notice, though, that this performance and risk advantage comes with very narrow ranges around the strategic asset allocations and hence with ±5% ranges which are more typical, the excess returns and risk management advantages will be much more significant.

More important, in reviewing alternative risk and quality of returns measures—namely *maximum drawdown*, *success ratio*, and *confidence in skill*—the results are more compelling. *Maximum drawdown* measures the maximum decline in the portfolio value during the historical period—to many a more important measure of risk as it is a better indicator of the fund's solvency. This statistic is humorously referred to as the "yield to fire," as it measures how much and for how long one can lose money before being fired or bankrupt. The *success ratio* represents the percentage of months that the portfolio outperformed its benchmark (or a comparable passive portfolio with the target allocations held constant), and the *confidence in skill* is a statistical measure of confidence one could have that these returns were the product of skill as opposed to luck.[3] On all these measures, SMART rebalancing performed much better than the other approaches. While past returns are no guarantee of future returns, essentially SMART rebalancing has the ability to take corrective action to asset allocation within the policy ranges and prevent bad asset allocation decisions from impacting performance and thereby risk.

"If you join a big corporation, you have to aspire to getting as far as you can." Tony Trahar

Figure 2. Investment structure of hypothetical US pension fund

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Table 1. Portfolio structure and target allocation

Asset class	Benchmark asset	Target allocation (%)	Range (%)
US Equity	S&P 500	31	2.86
International equity	MSCI EAFE	30	2.92
Fixed income	Lehman Brothers US	33	2.80
Composite			
Commodities	GSCI	6	1.50

Table 2. Comparing return and risk of informed rebalancing versus buy-and-hold and quarterly rebalancing

	Buy-and-hold (%)	Range rebalancing (%)	SMART rebalancing (%)
Annualized return	6.2	6.4	6.9
Standard deviation	9.3	8.6	8.7
Return/risk ratio	0.67	0.75	0.7
Maximum drawdown	−31.9	−33.1	−31.7
Success ratio	51.8	51.1	55.3
Confidence in skill	31.1	18.7	99.9

like setting the rudder in the direction of the destination without adjusting for wind direction, tides, or choppy seas, and without considering potentially faster ways of reaching the destination with less risk of drowning. SMART rebalancing, on the other hand, would involve making the appropriate adjustments.

Most importantly, as modern portfolio theory has taught us, the assets included in this portfolio are ideally uncorrelated with each other (or at least have low correlation). The logical extension of this assumption of low correlation is that in any given period (whether determined by market regimes, economic cycles, or calendar periods), some of these assets will perform better than others in the portfolio, and some will outperform their expected returns, while others will underperform these expectations. The static rebalancing approach to asset allocation assumes (or hopes) that these pluses and minuses will even out over time and should not be a concern in the ongoing asset allocation decisions. Moreover, there are many ongoing asset allocations that are necessary as a result of cash flows generated by the portfolio by way of dividends, coupon payments, and contributions, and disbursements to meet ongoing obligations.

SMART rebalancing takes the view that low correlation alone demands that responsible asset managers make asset allocation decisions to position their portfolio for these regimes/cycles/market conditions best and, by doing this well and systematically, can greatly improve the return per unit of risk. After all, most investors expect the same process from their external asset managers/mutual fund managers, and it is logical to demand this same responsibility, process, and governance at one decision level up from the portfolio's managers.

Markets are dynamic and asset returns are going up or down daily, resulting in new changes in the weights of assets changing each day. Many investors feel that if they do not take an explicit decision about an asset weight, they do not have a bet on the markets. However, quite the opposite is true! When applied to the decision on assets that have drifted in allocation above the long-term strategic weight because of strong recent performance, to not rebalance implies a view that this asset will continue to outperform. Similarly, triggering an automatic rebalancing decision to reduce (or increase) the weight on an asset back to its benchmark weight at the end of the quarter because a particular day has been reached, implies a view that this asset will do worse (or better) than other assets. Otherwise, to make such a decision would seem somewhat contradictory. In addition, a rebalancing decision makes the assumption that the benchmark allocation is the most desirable at all times (under all market conditions), and hence managing back to this asset allocation is best for the portfolio regardless of current market

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▶▶ MAKING IT HAPPEN

The key to this approach is that while it does involve a little more work than implementing (or recommending) a rebalancing policy, it has similar advantages.

- Simplicity. Once the rules are articulated (and typically these are either explained by fundamental arguments, well-researched trends or common intuition) they can be easily followed and implemented. This simplicity also allows investors to track a few key factors consistently and act on them with confidence.
- *Explicitness and transparency*. By definition, this approach requires a clear definition of the market factors (signals) that will be followed, how these will be used to make asset allocation decisions for the fund, and the policy controls operating on this decision-making process (frequency, asset bandwidths, etc.). Investors then will be able to analyze and vet these decisions thoroughly prior to approving them. This then allows them to execute what is now a disciplined and systematic set of decisions.
- *Superiority.* This approach is superior to the static/naïve rebalancing approaches because it recognizes the limitations of the SAA, makes implicit decisions explicit (what gets monitored gets managed), and operates in the area where the SAA is of limited value. Further, it is both responsible and responsive to current information, which is always more relevant and up-to-date than that used as an input for the SAA decision. Implementation of SMART rebalancing is very similar to static rebalancing and would be implemented in exactly the same way that a current rebalancing program would. In our experience, both programs are easily implemented using futures contracts, so this performance is very easy to achieve and hence does not have any impact on the rest of the portfolio.

"The idea was to prove. . .that you were one of the elected and anointed ones who had the right stuff and could move higher and higher and. . .join the special few at the very top." Tom Wolfe

conditions. So, all asset managers must realize that every decision—whether to overweight, underweight, or continue to allow assets to drift—is an active decision, whether it is made explicitly or implicitly. In short, all these approaches are tactical in nature, even though they are not labeled as such and are often even cloaked as just the opposite!

CONCLUSION

This article has described how the SMART rebalancing approach can meaningfully improve the performance of the investment portfolio. All decisions to change the asset allocation—whether to let the portfolio drift or rebalance on some static policy or to make informed rebalancing decisions—are active asset allocation decisions. Therefore, it is best to make such decisions in an explicit, disciplined, and informed manner by using the various measures that one should constantly be tracking for other investment decisions (economic, valuation, momentum, and market factors). In the current return environment, every bit of performance is needed to meet investment objectives. SMART rebalancing has the advantage of working on the entire asset base, with the added benefit that it can be implemented in addition to other things that may be done in the portfolio.

▶▶ MORE INFO

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Mcube Investment Technologies: www.mcubeit.com/Mcubesite/web/Books_Articles.html

See Also:
★ Asset Allocation Methodologies (pp. 281–285)
★ Money Managers (pp. 357–359)
✔ Mean–Variance Optimization: A Primer (p. 941)
✔ Understanding Asset–Liability Management (Full Balance Sheet Approach) (p. 889)
👤 Harry Markowitz (p. 1175)
👤 William Sharpe (p. 1193)
📖 Portfolio Theory and Capital Markets (p. 1310)

NOTES

1 See for example Arnott and Lovell (1993), Arnott and Plaxo (2002), Donohue (2003), Bernstein (2000), Buetow *et al*. (2002), Masters (2002), Leland (1996).

2 Leland (1996).

3 Muralidhar (2001), Chapter 9.

"Don't waste your effort on a thing which ends in a petty triumph unless you are satisfied with a life of petty issues." John D. Rockefeller