



## ABSTRACT

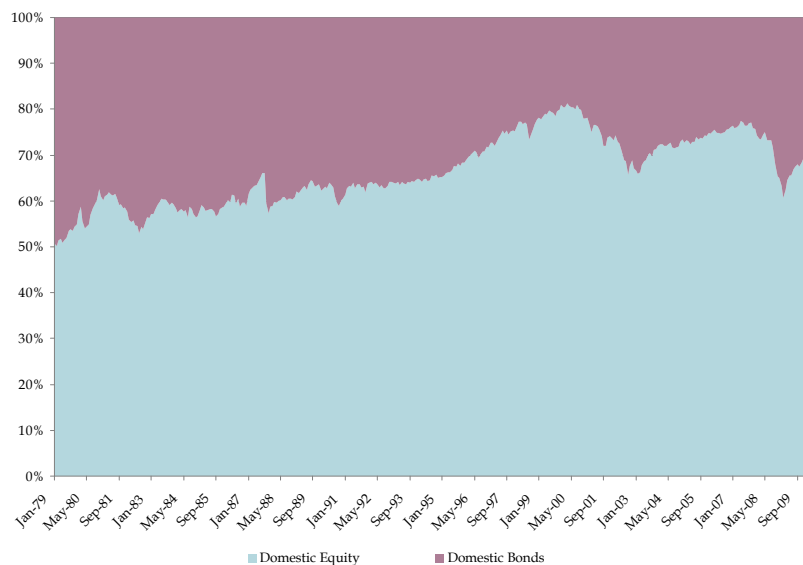
*Expectations of risk and return are determined by a portfolio's asset allocation. Over time, market returns can cause one or more assets to drift away from their initial asset allocation targets, leading to portfolios that may not reflect an investor's risk tolerance or investment goals. An investor must decide which rebalancing strategy, if any, is appropriate to maintain the target allocation. This paper presents a comparative analysis of different rebalancing strategies. Meketa Investment Group recommends adopting an explicit rebalancing policy, the precise form of which is dependent on a Board's preferences and governance structure.*

## OVERVIEW

Investors adopt long-term asset allocation targets in an effort to achieve specific investment goals. If, after careful consideration, an investor concludes that approximately 60% of his portfolio must be invested in equity-like assets, then it becomes important to maintain an allocation to equities of about 60% most of the time. Allowing the equity allocation to stabilize below 60% could diminish the investor's return prospects, while allowing the equity allocation to exceed 60% could result in unacceptable level of volatility.

Markets, however, are not static. First, assets have different expected growth rates—equities are usually expected to return more than investment grade bonds. As such, there will be a natural portfolio drift as riskier assets represent a greater portfolio share over time (see Figure 1). Second, market prices are volatile on both a short-term and a long-term basis. As an extreme example, the Russell 3000 index gained or lost at least 3% a week in seventeen of the fifty-two weeks between January 1, 2009 and December 31, 2009. And, in the twelve calendar months ending December 31, 2009, the Russell 3000 gained or lost an average of 7% per month, with individual monthly returns ranging from -10% to +11%. While historical volatility is considerably less, the general point remains that market volatility will affect a fund's asset allocation over all time periods.

**Figure 1. Portfolio Drift**



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Rebalancing is the process by which an investor maintains a pre-defined asset allocation in response to market movements. This paper provides a conceptual framework for rebalancing as an investment strategy and presents a comparative analysis of different rebalancing strategies.

### IS REBALANCING NECESSARY?

Not all investors rebalance—a strategy in which investments are allowed to drift freely is known as a “buy-and-hold” strategy. A buy-and-hold strategy generally works best when markets move in a single direction with relatively little volatility (i.e., a “trending” market), as when equities steadily outperform bonds over a number of years. In these cases, the portfolio steadily becomes dominated by the asset class with the highest returns.

In contrast, rebalancing strategies perform best when the markets experience repeated reversals, as when equities sharply outperform—then sharply underperform—bonds. The more frequent the changes in leadership, the greater the advantages for strategies that regularly rebalance allocations. It is for this reason that most investors consider rebalancing necessary for risk control. The act of rebalancing maintains the portfolio’s overall risk exposure, whether through limiting the natural portfolio drift towards risky assets or through the potential for higher risk-adjusted performance during volatile market environments.

### REBALANCING STRATEGIES

Several customizable rebalancing strategies are available for investors with different risk tolerances, durations, or liquidity constraints. While numerous rebalancing strategies have been proposed, most fall into one of the following categories:

#### **Passive Risk-based Rebalancing**

In passive risk-based rebalancing, the rebalancing decision is systematically determined by the volatility of the portfolio or component asset classes. In the case of portfolio risk-based rebalancing, the proportion of high and low volatility assets is adjusted either periodically or when the overall portfolio volatility changes appreciably. In this manner, the overall portfolio volatility is maintained. In the case of component asset classes, each asset class is assigned a “risk budget” that is maintained either periodically or when the volatility of a component asset class changes. Both of these approaches are complicated and, for this reason, are not particularly common.

#### **Passive Capital-based Rebalancing**

In passive capital-based rebalancing, the rebalancing decision is systematically determined by the overall capital share of the component asset classes. In the simplest case, allocations are adjusted periodically to maintain preset targets. In a slightly more complicated variant, allocations are adjusted when asset shares fall

outside of a “target range.” For example, if the equity target is 60% of the portfolio with a target range of +/- 5%, the equity allocation would be adjusted if it represented more than 65% or less than 55% of the portfolio.

There are several variations of this methodology. With *midpoint rebalancing*, if the common stock allocation moved above 65% or below 55%, funds might be purchased or sold in order to restore the percentage of common stocks in the portfolio to the midpoint, 60%. However, for an *endpoint rebalancing* schedule, if the asset’s proportion grew to over 65% it would be reset to 65%; similarly, if it fell below 55% it would be reset to 55%. There are many different styles of endpoint rebalancing (e.g., rebalancing halfway to the midpoint), but most seek to capitalize on market trends by not overcompensating for outperformance and underperformance by a particular asset class.

### **Active Rebalancing**

Instead of following a set of simple systematic rules to guide rebalancing, some investors prefer to rebalance tactically or opportunistically. In *tactical rebalancing*, an investor periodically rebalances based on shorter-term expectations for asset classes. This is essentially tactical asset allocation (TAA). In *opportunistic rebalancing*, an investor periodically *reviews* asset classes for attractive opportunities and only makes shifts when an attractive option is identified. Both of these strategies can be conducted in either risk or capital space.

For those plan sponsors who wish to implement a passive rebalancing approach, a decision must be made whether to make such rebalances required (as memorialized in an investment policy statement or through explicit direction to a custodian) or optional. Making the rebalancing action required means that the psychology of the decision is removed (e.g., the potential for irrational behavior), to the probable benefit of the portfolio. On the other hand, some plan sponsors may wish to systematically rebalance by default, but retain control over the decision in the event of unusual circumstances.

Since passive capital-based rebalancing strategies are the most common and also the simplest to analyze and to understand, we will evaluate these strategies more closely in the next section.

## **COMPARATIVE ANALYSIS**

To evaluate the merits of different passive capital-based rebalancing techniques, we constructed a policy portfolio of 40% domestic bonds, 45% domestic equity, and 15% foreign equity using the Barclays U.S. Aggregate, the Russell 3000, and the MSCI EAFE indices. The data collected were from January 1979 through June 2010, which includes a variety of market and economic conditions. Ten- and fifteen-year sub-periods were also examined, but they did not provide added insight into determining the optimal rebalancing technique and so are

not reported. For simplicity, we applied a flat fee of 2 basis points during any month in which rebalancing was required to account for transaction and commission costs.<sup>1</sup>

For our first analysis, we examined the effects of employing different frequencies in a passive periodic rebalancing strategy. The results of our first analysis are shown in Figure 2.

Figure 2. Periodic Rebalancing, January 1979-June 2010

Rebalancing Timeframe	Annualized Return	Cost-Adjusted Annualized Return	Standard Deviation	Cost-Adjusted Sharpe Ratio	Number of Rebalancing Actions
Monthly Rebalancing	10.19%	9.96%	10.82%	0.41	378
Quarterly Rebalancing	10.25	10.17	10.79	0.43	125
Semiannual Rebalancing	10.21	10.17	10.75	0.43	62
Annual Rebalancing <sup>2</sup>	10.31	10.29	10.80	0.44	31
Buy-and-Hold	10.20	10.20	12.88	0.36	0

As can be seen in Figure 2, all four periodic rebalancing strategies outperformed the buy-and-hold strategy on a risk-adjusted basis. While each of the four periodic rebalancing techniques successfully lowered volatility by roughly 2%, monthly, quarterly, and semiannually rebalancing produced relatively lower returns because of several instances where rebalancing required selling off an outperforming asset class in order to purchase another that was underperforming. In other words, frequent rebalancing did not take advantage of trending markets. Cost-adjusted returns for monthly, quarterly, and semiannual rebalancing were negatively impacted by the relatively large number of minor rebalancing operations.

Annual rebalancing appears to be the best periodic rebalancing strategy for two reasons. First, it has historically offered a relatively high return for a given level of risk. Indeed, it appears to have benefited from trending markets by not selling winners too early. Second, and perhaps more importantly, annual rebalancing may further outperform its monthly, quarterly, and semiannual counterparts on a cost-adjusted basis because it requires far fewer rebalancing actions and hence incurs fewer transaction costs.

Passive range rebalancing is another strategy for maintaining the desired asset allocation. Range rebalancing's main advantage is that instead of reflexively rebalancing assets every period, range rebalancing only rebalances when any asset's portfolio share falls outside a pre-determined range.

There is an inherent trade-off between large and small target ranges. Larger ranges require less frequent rebalancing, thus reducing associated transaction costs. Furthermore, larger ranges may enable the portfolio to benefit from broader market trends. However, ranges that are too wide permit too much deviation from the target allocation, altering the portfolios

<sup>1</sup> Note that these costs can be significantly higher for less liquid asset classes.

<sup>2</sup> Annual rebalancing as reported takes place on January. Annual rebalancing schedules occurring in April, July, and October were examined but led to essentially the same results.

risk posture unacceptably. Acknowledging these trade-offs, we recommend ranges of about 5-10% around the target policy.

In our range rebalancing analysis, 5% and 10% bands were established in both midpoint and endpoint rebalancing strategies. The midpoint rebalancing simulation reset all assets to their target percentages whenever any one of the assets fell outside the range at the end of a month. The endpoint rebalancing procedure was more complicated. Whenever the percentage of a particular asset class fell outside the range, it was lowered or raised to the closest endpoint of the range and this excess percentage was added to or subtracted from the asset of least correlation. This would ensure that the strategy would take full advantage of the diversification benefits of rebalancing since shifting funds from one asset to another whose returns behave similarly would have had little purpose. For a 10% range, for example, if at the end of one month foreign equity stood at 27%, it would be reset to 25% (instead of 15%) and *bonds* would be increased by 2% since foreign equity is less correlated with bonds than it is with domestic equity. Domestic equity would be unaffected by such a rebalance. At the end of months where more than one asset class was outside the range, the asset that was further outside the range would be reset to the endpoint and the difference would be added to or subtracted from the other asset, effectively restoring it within the range. The results for all four simulations are recorded in Figure 3.

Figure 3. Range Rebalancing, January 1979-June 2010

Rebalancing Range	Rebalancing Point	Annualized Return	Cost-Adjusted Annualized Return	Standard Deviation	Cost-Adjusted Sharpe Ratio	Number of Rebalancing Actions
+/- 5 %	Midpoint	10.25%	10.24%	10.87%	0.44	19
	Endpoint	10.34	10.29	10.87	0.44	84
+/- 10%	Midpoint	10.40	10.40	10.91	0.45	7
	Endpoint	10.32	10.29	11.19	0.43	47
Buy-and-Hold	N/A	10.20	10.20	12.88	0.36	0

Again, all four range rebalancing strategies appear to dominate the buy-and-hold strategy. While the rebalancing strategies did not meaningfully enhance cost-adjusted returns, they did meaningfully lower the portfolio's standard deviation. Generally, there was little difference between midpoint and endpoint rebalancing from a performance standpoint. Instead, the difference lies mostly in the relative number of rebalances. In a situation where rebalancing incurs a flat fee (such as in our own analysis), midpoint range rebalancing would be advantageous because it minimizes the number of rebalances. However, if costs are proportional to the amount of funds rebalanced, endpoint rebalancing would be optimal because of the small amount of capital transferred during each rebalance. Also, note that midpoint rebalancing involves moving as much as 5-10% of the portfolio at any time, which may occur during periods of market distress. Making a decision to reinvest such a large allocation in a likely underperforming (or more likely, declining) asset class may be difficult for even the most steadfast investor.

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Note that while a portfolio that includes more than three asset classes will inevitably incur more costs during each rebalancing action, this problem may be offset by the portfolio requiring less rebalancing actions under a range rebalancing schedule because each asset is less likely to trigger a rebalance since it represents a smaller percentage of the entire portfolio. However, it is recommended that plan sponsors who adopt range rebalancing focus mainly on whether aggregate asset classes (e.g., all equities, all bonds, all real assets) are outside of their ranges in order to make sure that the aggregate risk profile does not deviate too markedly from the policy target. Finally, be aware that wider ranges will result in an asset allocation that may deviate substantially from a plan's policy allocation, especially if endpoint rebalancing is used.

Overall, there are two takeaways from these simple analyses. First, any passive rebalancing strategy – whether periodic or range-based – is better than a buy-and-hold strategy. Second, periodic rebalancing at a frequency greater than one year may not be necessary.

#### PERFORMANCE DURING 2007-2009

During the extreme volatility of 2007 through 2009, many investors reasonably questioned the value of rebalancing. In Figure 4 below, we show the results of our two analyses during those difficult years. While there was significant variation between the rebalancing strategies, we note again that all rebalancing strategies outperformed the buy-and-hold approach – and in this case by a much wider margin. Note also that – in contrast to the full period analysis – the precise month during which the annual rebalancing took place mattered significantly. For example, an annual rebalance in October 2008 led to an investment in stocks before the big crash, while an annual rebalance in April 2009 led to an investment in stocks before an extraordinary rally. Nevertheless, even the October 2008 rebalancing schedule outperformed the buy-and-hold approach. Given the hesitation by many investors to rebalance during such violent market behavior, plan sponsors may wish to make their rebalancing strategy required (as described above).

Figure 4. Rebalancing, January 2007-December 2009

Rebalancing Strategy	Rebalancing Point	Annualized Return	Cost-Adjusted Annualized Return	Standard Deviation	Cost-Adjusted Sharpe Ratio	Number of Rebalancing Actions
+/- 5 %	Midpoint	0.56%	0.54%	13.20%	-0.12	3
	Endpoint	0.61	0.56	13.15	-0.12	8
+/- 10%	Midpoint	0.53	0.52	13.21	-0.12	1
	Endpoint	0.19	0.17	12.80	-0.15	2
Monthly	N/A	0.35	0.11	13.42	-0.15	35
Quarterly	N/A	0.55	0.48	13.37	-0.12	11
Semiannually	N/A	0.68	0.65	13.09	-0.11	5
Annually						
January	N/A	1.10	1.08	12.94	-0.08	2
April	N/A	1.47	1.45	13.01	-0.05	2
July	N/A	0.59	0.59	12.42	-0.12	2
October	N/A	0.25	0.24	12.59	-0.15	2
Buy-and-Hold	N/A	-1.88	-1.88	15.87	-0.25	0

### MINIMIZING REBALANCING COSTS

There are numerous means by which a multi-asset investment fund can be rebalanced, and depending upon the mechanism chosen, the effective cost of rebalancing adjustments can range from very little to substantial. As with most portfolio strategies, Meketa Investment Group recommends that investors seek a solution that minimizes the cost.

Rebalancing shifts can be implemented with three generic strategies. In order of increasing transaction cost, these are: directing necessary cash flows, using index funds, and shifting actively managed assets. There is a fourth option: an overlay approach in which a plan directs a custodian to purchase and sell futures on a (usually) daily basis in order to maintain a target allocation. However, this option can be expensive because of the frequency with which it rebalances and it also imperfectly rebalances because it does not move funds—that is, it carries “basis” risk. Rebalancing should not be viewed as a separate task, however, since many ordinary investment activities (e.g., implementing manager changes) provide an opportunity to accomplish a rebalancing objective at the same time.

#### Directing External Cash Flows

In our judgment, external cash flows (i.e., external contributions or withdrawals from investment assets) should *always* be used as a rebalancing tool. In this way, a necessary event (i.e., the cash flow) is made to serve two purposes at no additional cost. Cash should be used to return assets to an allocation target even if the assets remain within the target range.

The cheapest mechanism for effecting rebalancing moves is to direct external *positive* cash flows (i.e., new contributions) to underweighted asset classes. New monies purchase additional positions in the most underweighted assets. The operating cost of this type of rebalancing is essentially zero.

External *negative* cash flows (i.e., net withdrawals), on the other hand, pose a slightly more complex problem. If money must be withdrawn, there may be several potential sources of funds, each with a different associated operating cost. For example, if common stocks are overweighted when a net withdrawal is necessary, it may be possible to make the withdrawal from the cash reserves of active equity managers, or to make the withdrawal by liquidating positions in an equity index fund. Selling positions in an index fund, while not free, is generally much cheaper than causing active manager turnover.

If a withdrawal can be spread across several active managers such that the impact on any one manager's cash reserves is small, then we recommend that approach. If, on the other hand, a withdrawal would deplete a manager's cash reserves, then taking the money from an index fund (if one exists) is probably more efficient.

### **Redirecting Income**

Virtually all portfolios generate at least some income (i.e., dividends, interest, or other corporate actions). Most investment managers deposit the income in their portfolios' cash reserve pools to be used as a source of investment funds.

A capable custodian bank, however, can "sweep" cash holdings from overweighted asset classes to underweighted asset classes. With this strategy, dividend and interest income serves the same low cost rebalancing purpose as net new contributions.

### **Using Index Funds**

Occasionally it is necessary to effect a rebalancing by shifting assets actively from one asset type to another. For example, in a sustained bull market for common stocks, a fund's equity allocation may grow to the point where it is no longer seen as prudent. In such a case, it will be necessary to liquidate equities and buy bonds to restore balance.

Index funds offer an excellent, low-cost mechanism for rebalancing. Index fund managers are skilled at buying and selling securities at very low brokerage costs, and often with minimal market effects. Index fund managers sometimes swap securities with other investors, or use crossing networks to affect trades. Commingled index funds may have sufficient cash flow to provide cost-free rebalancing, in many cases.

A series of two to three equity index funds and a bond market index fund are particularly efficient for implementing rebalancing shifts. By shifting assets between one or more of the equity index funds and a bond index fund, an investor can

maintain not only an overall equity/bond ratio, but also a capitalization structure and value/growth tilt as well. Meketa Investment Group recommends this approach highly for larger investment funds.

### **Using Active Managers**

The most expensive mechanism for implementing rebalancing shifts is to instruct active investment managers to buy or sell securities. Without index funds, however, this may be the only vehicle available to an investor. We recommend that when it is necessary to use active managers to rebalance, the affected managers be permitted to make the changes over a reasonable time period to avoid hasty (and unnecessarily expensive) turnover.

### **REBALANCING VERSUS MARKET TIMING**

Active rebalancing (i.e., maintaining prudent asset allocation levels) is not the same as market timing. Rebalancing is the adjustment back toward an agreed upon asset allocation *in response to* market induced changes. Market timing is the deliberate adjustment of an asset allocation *in anticipation of* a market shift. For example, a market timing investor who expects the equity market to decline may exchange common stocks for bonds or cash in advance of the anticipated equity decline. If the equity market does, in fact, decline, that investor's returns are improved. If, on the other hand, the equity market goes up, the investor's returns are degraded.

Dozens of academic studies of market timing strategies have been conducted over the past thirty years. These studies indicate that successful market timing is very difficult to implement. That is, few investors are able to correctly identify market shifts in advance with sufficient accuracy to recover the costs of the extra turnover and the losses associated with incorrect judgments. The realities of the governance structure for many institutional plans also make it difficult to reach a consensus on the direction of the market in a timely manner. Therefore, Meketa Investment Group recommends that investors carefully consider whether they want to engage in market timing or limit their rebalancing activity to a systematic approach.

### **CONCLUSION**

Meketa Investment Group believes that there are several appropriate approaches to rebalancing, including annual rebalancing and employing target ranges. Depending on the cost structure, the strategy may require customized cash flow management or adjustments to the rebalancing point in order to avoid excessive transaction costs. Alternatives do exist, however, and plan sponsors should evaluate with the help of their consultant whether a different portfolio rebalancing strategy, including a more tactical approach, is warranted. Overall we believe that any of these rebalancing approaches is superior to a policy of not rebalancing.