Many financial advisers appreciate the importance of appropriate asset allocation for their clients. Brinson and Beebower (1986) found that the asset allocation decision accounts for approximately 90 percent of the variability in portfolio returns, a finding that is well-publicized and often quoted. While advisers expend a great deal of effort determining the appropriate asset allocation for a client, a vital element of the overall asset allocation strategy—rebalancing—may not receive the same attention.

Active portfolio rebalancing, or the process of reallocating portfolio assets back to a policy target, may provide the following benefits:

- **A more consistent portfolio experience (i.e., lower risk).** Active rebalancing, by definition, requires the reduction of portfolio sectors that have become overweighted due to volatility and appreciation differences. By preventing certain sectors from becoming overweighted, the risk of the portfolio may be reduced. Also, rebalancing the portfolio helps protect gains and may enhance performance of long-term assets. (It is important to note that any gain recognition may have current tax consequences.)

- **The potential for increased returns.** Several studies have identified a “rebalancing bonus” derived from an active rebalancing methodology. This bonus may be available depending on the time period and asset classes used in portfolio construction.

A disciplined process to making difficult financial choices. A formal rebalancing process requires investors to reduce their exposure to assets that have performed well recently and add to assets that have underperformed or are currently out of favor. This process is, by its very nature, counter-intuitive and difficult for investors to adopt. Numerous academic studies have documented how emotion and cognitive biases influence investors and the decision-making process. A defined rebalancing process removes emotions from the financial management equation because the decisions already have been made.

**Executing a Rebalancing Methodology**

Rebalancing requires an investor to adjust the weights of portfolio components back to the target weights established as part of the initial investment policy. This adjustment can be made using any of the following methods:

- **Periodic rebalancing.** This approach specifies regularly scheduled adjustments to bring the portfolio back to the original targeted allocation (see figure 1). Most studies suggest a very minor difference between quarterly, semi-annual, or annual rebalancing, so many advisers have adopted the less-frequent, annual rebalancing approach to minimize transaction costs and tax recognition.

The greatest advantage of periodic rebalancing is its simplicity.

Longer periods have the advantage of lower transaction costs with the disadvantage of increased tracking error and vice versa. Because this class of rebalancing strategy is independent of market performance, its performance will depend upon relative timing of both large market movements and the act of rebalancing.

- **Range rebalancing.** This approach requires rebalancing to take place when the allocation deviates from the intended target beyond a certain range of tolerance, usually 3–5 percent from the initial target. The portfolio weights are adjusted back to the outer limit of the tolerance. For example, consider a 40-percent value-equity mix, with 5-percent tolerance. This entails a sale of 1 percent when value equity grows to 46 percent of assets (see figure 2).

- **Threshold rebalancing.** This approach follows the original policy more closely. Here, a move beyond the threshold
Rebalancing Methodology—A Hypothetical Illustration

Table 1 illustrates periodic rebalancing using a hypothetical $1-million portfolio. The table includes the initial allocation amounts to each of the asset classes, the returns produced in the first year, the resulting asset class values at the end of the first year, the new allocation targets, and the necessary portfolio adjustments.

Table 1 uses calendar year 2002 to demonstrate how rebalancing can be counterintuitive to investors. At the end of 2002, after another poor annual performance for equities and a rising municipal bond market, few investors would have withdrawn money proactively from their fixed income holdings and added it to their equity holdings. However, this was precisely the action required to rebalance the portfolio and enable the investor to capture some of the benefits discussed earlier.

Rebalancing Bonus—A Hypothetical Example

The following example shows the results after 20 years of a static approach (i.e., no rebalancing) compared with an active periodic rebalancing approach and the “rebalancing bonus” achieved. The example uses the following assumptions:

- A policy allocation of 25-percent Russell 1000 Value, 25-percent Russell 1000 Growth, 30-percent Lehman Municipal, 10-percent Russell 2000, and 10-percent MSCI EAFE.
- An investment time frame from January 1985 through December 2004.
- Rebalancing to the policy allocation occurs annually on December 31st.
- Transaction costs, cash flows, and taxes are ignored, all of which would have reduced returns.
- An initial investment of $1 million.

Using these assumptions, the
rebalanced portfolio produced an increase in return of 5.1 percent over the static portfolio but, perhaps more importantly, reduced volatility (as measured by the standard deviation) by more than 19 percent (see table 2).

**Analysis of Various Rebalancing Scenarios:**

To compare the impacts of different rebalancing techniques, the same hypothetical portfolio was rebalanced using each of the four strategies described above. The parameter that produced the highest Sharpe Ratio for each method is highlighted in table 3. The Sharpe Ratio was chosen for this illustration because it is a measure of efficiency and a reliable measure of return per unit of risk. Consultants and their clients should make their own determination based on the characteristics that are of greatest importance to them; other important attributes to consider might be returns, risk, or tax sensitivity.

Figure 5 shows a risk-versus-return plot of the rebalancing strategies with the highest Sharpe Ratio for each of these methods and the static portfolio.

The key conclusions from this exercise are the following:

- Rebalancing reduced volatility. The static portfolio experienced both higher absolute volatility (13.6 percent) and higher volatility per unit of return7 (1.18 percent) than any of the active rebalancing strategies.
- Regular quarterly rebalancing returns performed better than the less active annual rebalancing.
approach and the more frequent monthly rebalancing strategy. The data suggest an intermediate frequency that balances a rigid asset allocation policy with allowing the portfolio to move in tandem with favorable market movements.

When comparing threshold rebalancing with midpoint threshold rebalancing, the results show that rebalancing all the way back to the target allocation resulted in higher volatility. Longer cycles of market leadership provide a higher probability that some portion of the allocation will breach a rebalancing threshold. Thus, rebalancing all the way back to the original allocation will increase the amount of drift between the policy allocation and the portfolio at the rebalancing threshold. The larger the threshold, in turn, the larger the likelihood of greater portfolio volatility. That is, the more the allocation is allowed to drift, the higher the probability of increased portfolio volatility.

Less restrictive rebalancing guidelines can enhance results, particularly if the portfolio is rebalanced to the outer bounds of the allowed range. Not surprisingly, during the period observed, the less restrictive noncalendar rebalancing approaches resulted in the higher return. For example, in the threshold rebalancing scenario, the wider ranges resulted in incrementally higher returns albeit with higher standard deviations accompanying the returns. The exact set of thresholds selected is a sensitive initial condition. Choosing these thresholds often can be an exercise in back-fitting and will not necessarily indicate appropriate thresholds for the future. A particular set of thresholds will cause rebalancing to occur at opportune times over a select time period, but might then allow drift over the entire subsequent period if the volatility decreases slightly. The thresholds would need to fluctuate over time to qualify as a fully reactive process.

There is a direct relationship between narrowing the ranges and increasing the frequency of the rebalances. Table 4 shows the number of times portfolios were rebalanced in the scenarios described above, based on the range/tolerance selected. Threshold rebalancing on the whole performed very well and was not sensitive to the breadth of the thresholds. Given that the range of returns for the 2-percent to 20-percent thresholds are narrowly dispersed between 11.78 percent and 11.98 percent, it can be concluded that the breadth of thresholds makes no meaningful difference to returns.

### TABLE 4 Implications of Range Selection

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</table>

### Additional Considerations When Rebalancing

#### Periodic versus range rebalancing

Active rebalancing can be approached with either a periodic rebalancing strategy that allows tactical changes in periodicity or a range rebalancing strategy with ranges that may fluctuate tactically. The goal for active rebalancing simply is to determine whether the asset mix has strayed too far from the benchmark and needs to be rebalanced. The investor and/or adviser must decide whether the active exposures are justified and the portfolio should be left as is.
Range rebalancing is an easy-to-implement option. Wider ranges will reduce transaction costs at the expense of higher tracking error costs and vice versa. Unlike periodic rebalancing, asset performance will trigger range rebalancing. For a portfolio with a wide range of ratio targets, setting an effective range is difficult. Assets with higher target ratios and greater volatility will generate most rebalances.

In general, the number of times a portfolio will require rebalancing indicates the level of attention that a strategy requires. As the time period or the percentage range increases for rebalancing methods that are calendar-based or volatility-based, respectively, the number of rebalances is reduced. The wider ranges can lead to large tracking error, however, as asset proportions may drift significantly from targets. On the other hand, more-active risk-rebalancing strategies have lower ranges/thresholds to keep asset proportions in line with the original policy allocation. Therefore, these strategies generally have a relatively high number of rebalances. The increased trading leads to higher transaction costs.

Asset class correlation
Rebalancing works best when the portfolio’s asset classes move in opposite directions. The results of a study published by Cindy Sin-Yi Tsai (2001) showed that portfolios consisting of 80 percent to 98 percent equities showed little benefit from rebalancing. All equities tended to move in tandem, even those in different asset classes. It is important then to look for a correlation that is 0.80 or less between asset classes when rebalancing; anything greater than 0.80 is too highly correlated.

Taxes
The potential impact of transaction costs and tax recognition are important issues when selecting a rebalancing strategy. To determine the effect taxes may have on the decision to rebalance, the after-tax results of the hypothetical static portfolio were compared to those of the hypothetical annually rebalanced portfolio. The following assumptions were used to illustrate the after-tax value of both portfolios:
• For both portfolios, the following percentage of index gains are assumed to be realized and subsequently taxed at long-term capital gains tax rates: 20 percent of the Russell 1000 Value, 40 percent of the Russell 1000 Growth, 10 percent of the Lehman Municipal, 40 percent of the Russell 2000, and 35 percent of the MSCI EAFE.
• For the rebalanced portfolio only, a portion of the portfolio is assumed to be liquidated when rebalancing, which generates more capital gains. It is then assumed that 30 percent of the sales proceeds are long-term gains.
• For both portfolios, taxes are paid from the portfolio balance at the end of the year. In the first year the gains are assumed to be short-term and are taxed at 35 percent; in subsequent years they are assumed to be long-term and taxed at 15 percent.

Table 5 outlines the impact of taxes on the two portfolios. The annually rebalanced portfolio, even after adjusting for the effect of taxes, produced a more consistent return stream than the after-tax static portfolio. As well, the annually rebalanced portfolio had an end value that exceeded the static portfolio end value by more than $170,000.

Transaction costs
Portfolio rebalancing involves transaction-cost trade-off: the cost of trading versus the cost of not trading. The cost of not trading affects clients in several ways, including holding an overpriced asset that offers potentially inferior future rewards or holding a poorly diversified portfolio that may no longer fit the needs of the client. Trading costs include commissions as well as the impact that a trade may have on the market. The essence of rebalancing, or portfolio management, lies in weighing and balancing these opposing costs. While frequent rebalancing would keep the portfolio closely aligned with its target, the transaction costs eventually may outweigh the benefits. The use of managed accounts and other fee-based investment solutions may reduce, if not eliminate, the potential impact of transactions costs.

An investor’s qualified plan may allow rebalancing without incurring redemption or trading fees on the funds in the program. If so, quarterly rebalancing might give the investor a slight edge by holding the portfolio closer to the asset allocation policy. For the investor holding assets in a regular taxable account that must accommodate tax and fee implications, it may be more appropriate to rebalance on an annual basis.

Behavioral Aspects
Much of economic and financial theory is based on the premise that when individuals make decisions they act rationally and consider all available information. Studies in behavioral finance show repeated patterns of irrationality and inconsistency in the ways investors arrive at decisions, especially when faced

| Table 5 After-tax Comparison of Static and Annually Rebalanced Hypothetical Portfolios |
|--------------------------------------------|----------------|----------------|------------|---|
| STATIC PORTFOLIO | ANNUAL REBALANCING |
| ENDING VALUE | AFTER TAXES | AFTER TAXES | DIFFERENCE | IMPACT |
| $8,087,986 | $8,258,964 | $170,978 | +2% |
| STANDARD DEVIATION | 13.6% | 12.0% | –1.6% | –12% |
Efficient rebalancing has the potential to yield striking benefits, especially in reducing risk. As the outperforming asset classes come to represent a larger portion of the portfolio, the concentration of risk in the portfolio increases.

Conclusion
Efficient rebalancing has the potential to yield striking benefits, especially in reducing risk. As the outperforming asset classes come to represent a larger portion of the portfolio, the concentration of risk in the portfolio increases.

Regret aversion. The strong desire to avoid losses can cause some investors to hold onto losing investments that show little promise of posting a gain. These investors are seeking to avoid the pain of recognizing a loss that would come from selling a poorly performing security, even though they are deviating from their target portfolio mix.

Overconfidence. Humans have a tendency to overestimate their abilities, knowledge, and skill and to place too much confidence in the value of their information. They believe they are right more often than they actually are. Overconfidence leads investors to believe they can pick stocks better than the overall market.

Herd mentality. Many investors find “comfort in crowds,” taking their information by observing other investors. This natural tendency to follow the crowd leads to buying and selling securities over a period of time and ignoring potentially contradictory information.

An established rebalancing strategy can provide the necessary discipline to help investors avoid aversive behaviors and keep them from being overconfident or following the herd. By understanding the human side of investing and recommending a disciplined asset allocation policy, advisers can use rebalancing to help clients achieve financial goals.

Conclusion
Efficient rebalancing has the potential to yield striking benefits, especially in reducing risk. As the outperforming asset classes come to represent a larger portion of the portfolio, the concentration of risk in the portfolio increases.

Endnotes
3. Russell 1000® Growth Index (Large-Cap Growth) measures the performance of those Russell 1000 companies with higher price-to-book ratios and higher forecasted growth values.
   Russell 1000® Value Index (Large-Cap Value) measures the performance of those Russell 1000 companies with lower price-to-book ratios and lower forecasted growth values.
   Lehman 7-Year Municipal Bond Index (Municipals) is the 7-Year (6–8) Lehman 7-Year Municipal Bond Index (Municipals).
component of the Lehman Brothers Municipal bond index, which is a market-value-weighted index engineered for the long-term tax-exempt bond market. Russell 2000 Index (Small-Cap) measures the performance of the 2,000 smallest companies in the Russell 3000 Index, which represents approximately 8 percent of the total market capitalization of the Russell 3000 Index. MSCI EAFE (International) is a Morgan Stanley Capital International index that measures the performance of the developed stock markets of Europe and Australasia.

4. Lehman Municipal bond index is an index engineered for the long-term tax-exempt bond market.

5. Past performance is no guarantee of future results.

6. Assumed risk-free rate is 4.30 percent.

7. Volatility per unit of return (coefficient of variation) is equal to the portfolio standard deviation over portfolio return.

8. Tracking error is a measure of the standard deviation of the differences in return between a portfolio and its benchmark.


11. Because index funds are used in this hypothetical example, every year a certain portion of capital gain is considered realized due to the recapitalization process followed by most index providers. It is then taxed at the long-term capital gain tax rate of 15 percent. The index gains that are assumed to be realized each year are: 40 percent of large-cap growth, 20 percent of large-cap value, 40 percent of small-cap, 35 percent of international equity, and 10 percent of municipal bonds. As well, a portion of the portfolio needs to be liquidated when paying taxes and rebalancing. This generates more realized capital gains. It is assumed that 30 percent of the sales proceeds are taxed at the highest marginal long-term capital gain rate. Finally, taxes are deducted from the portfolio balance at the end of the year.

References


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Information was obtained from third party sources, which we believe to be reliable but not guaranteed. Hypothetical examples have been provided for illustration only and are based on index returns. A time-weighted, annually-linked compounded method was used to calculate portfolio returns. All indices are unmanaged and unavailable for direct investment. Hypothetical portfolios do not reflect the performance of an actual portfolio. Index returns include reinvestment of income, and do not reflect taxes, withdrawals, investment advisory and other fees that would reduce performance in an actual portfolio. Different benchmarks and economic periods will produce different results. Other methods may produce different results, and the results for individual portfolios may vary depending on market conditions and the composition of the portfolio. Past performance is no guarantee of future results. All investments carry a certain degree of risk and there is no assurance that an investment will provide positive performance over any period of time. Investing in municipal bonds involve risks such as interest rate risk, credit risk, and market risk, and the possible loss of principal. Income may be subject to the alternative minimum tax (AMT) and/or state and local taxes, based on the investor’s state of residence.