

Rebalancing Diversified Portfolios Of Various Risk Profiles

by Cindy Sin-Yi Tsai, CFA

This study explores a variety of portfolio rebalancing strategies. Unlike many previous studies that used simplified portfolios, this study applies the strategies to a series of diversified portfolios consisting of multiple asset classes and a variety of risk profiles, thereby more closely mirroring real-world situations. Results show that although it is important to rebalance a portfolio, it matters less which rebalancing strategy advisors adopt. Performance and risk differentials are small between the various strategies tested, and there is no one strategy that outperforms across portfolios of different risk profiles. This implies that advisors should consider other criteria—such as clients' tax/transaction concerns or the limitations of their own reporting systems—when choosing a rebalancing strategy.

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After analyzing an investor's investment profiles and recommending an asset allocation plan, an important next step is to set a rebalancing policy. Portfolio weightings drift from the asset allocation targets over time as asset classes produce different returns. Rebalancing to the asset allocation policy weights ensures that the portfolio's risk exposure is not far different than originally intended. But which rebalancing strategy will produce the best results for your client?

This study analyzes five commonly used strategies:

- Never rebalance
- Mandatory rebalance monthly
- Mandatory rebalance quarterly
- Rebalance if any asset class drifts by more than five percentage points at month-end
- Rebalance if any asset class drifts by more than five percentage points at quarter-end

Unlike much previous research, this study focuses on the real-world consequences of each rebalancing strategy. Instead of a simplified stock/bond mix—most studies use 60 percent stocks and 40 percent bonds—this study analyzed results across a variety of portfolios consisting of differing weightings of seven asset classes. After all, not all investors have a risk profile of 60 percent stocks/40 percent bonds, and portfolios with significant weightings in such asset classes as international equity and high yield bond may react differently from those composed of more traditional stocks.

Therefore, this study evaluates portfolios composed of seven asset classes: large cap equity, small/mid cap equity, international equity, real estate, domestic bond, high yield bond and cash equivalent. Five portfolios are constructed representing varying risk profiles: 20 percent equity holdings, 40 percent, 60 percent, 80 percent and 98 percent. The allocations of the seven asset classes are detailed in Table 1. Note that riskier asset classes such as small/mid-cap equity rise proportionally with the increasing risk tolerance of the portfolios with higher overall equity weightings. Also, each portfolio places at least two percent of assets in a cash equivalent as a reserve for advisory and other fees. This study uses indices as proxies for these asset classes and the common time period is January 1986 to December 2000. See the Appendix for a description of data sources.

TABLE 1

**Five Portfolios of Varying Risk Profiles
And Their Percentage Compositions**

	20% Equity	40% Equity	60% Equity	80% Equity	98% Equity
Large Cap Equity	8	20	30	40	48
Small/Mid Cap Equity	2	7	13	20	25
International Equity	5	10	15	20	25
Real Estate	5	3	2	0	0
Domestic Bond	65	45	28	8	0
High Yield Bond	10	10	10	10	0
Cash Equivalent	5	5	2	2	2

Never Rebalancing

Put simply, never rebalancing a portfolio is a bad idea. A portfolio can deviate significantly from its asset allocation policy. The combined equity holdings of the 20 percent equity portfolio increased to a maximum of 36 percent over the allocation during the 15-year study period. The 40 percent equity portfolio increased to 63 percent, the 60 percent equity portfolio to 80 percent and the 80 percent equity portfolio to 91 percent. These are significant deviations from the original allocations and push investors to higher-risk profiles than originally intended.

Moreover, such increases are not isolated incidents. Each of the portfolios studied spent a large percentage of the study period out of balance from the original allocation. Since there is no one rule defining significant deviation, Table 2 offers three common rules of thumb and the percentage of times the portfolios are in violation of each of the three rules. For example, in the 60 percent equity portfolio, at least one asset class deviated from the allocation by at least 5 percentage points 71 percent of the time. The combined equity holdings of the portfolio deviated by five percentage points 78 percent of the time, and by ten percentage points 28 percent of the time. In general, Table 2 shows that all the portfolios spent a significant amount of time out of balance. Although numbers are smaller for the 20 percent equity portfolio, investors in this risk profile were most likely the least tolerant of increased equity exposure.

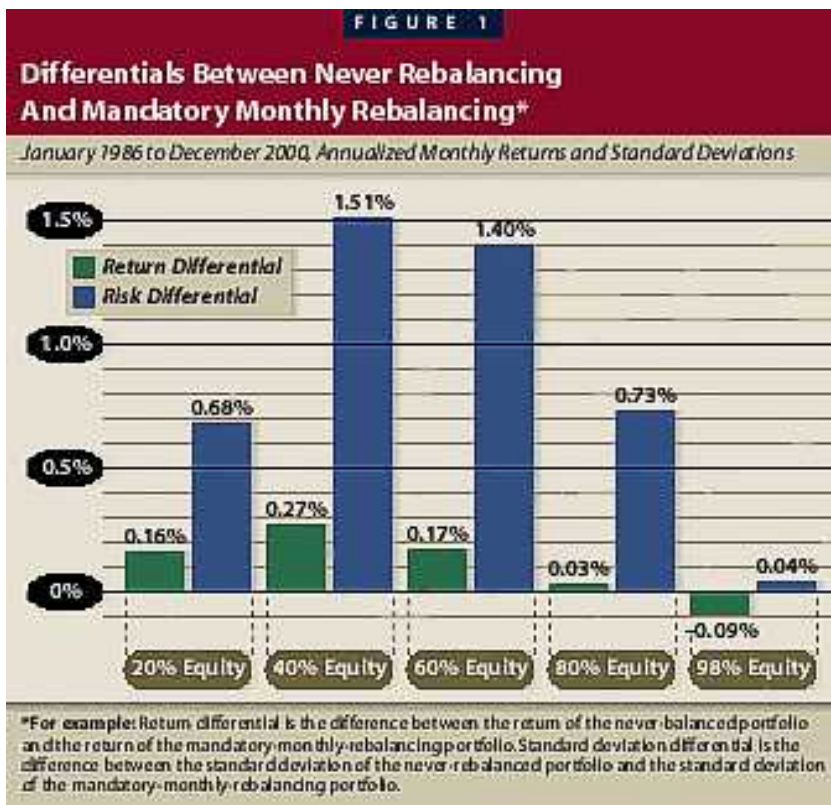
TABLE 2

**Percentage of Time Portfolios Are
Out-of-Balance as Measured by Three Rules**

180 Months from January 1986 to December 2000

	Any Asset Class > 5% Points	Combined Equity > 5% Points	Combined Equity > 10% Points
20% Equity	36	43	19
40% Equity	68	79	33
60% Equity	71	78	28
80% Equity	65	39	7
98% Equity	60	n/a	n/a

Some may argue that "letting winners run" tends to produce higher returns—a particularly appealing thought during the recent long bull market. Figure 1 demonstrates that the incremental return is actually small or nonexistent compared with the additional risk—as measured by volatility—taken on. Judged against a benchmark portfolio of mandatory monthly rebalancing, the never-rebalanced portfolios show significantly higher risk compared with small, or even negative, differences in annualized return. Moreover, Figure 3 shows that never-rebalanced portfolios produce the lowest Sharpe ratios—a risk-adjusted measure that indicates the incremental return gained by taking on more risk—across all risk portfolios.

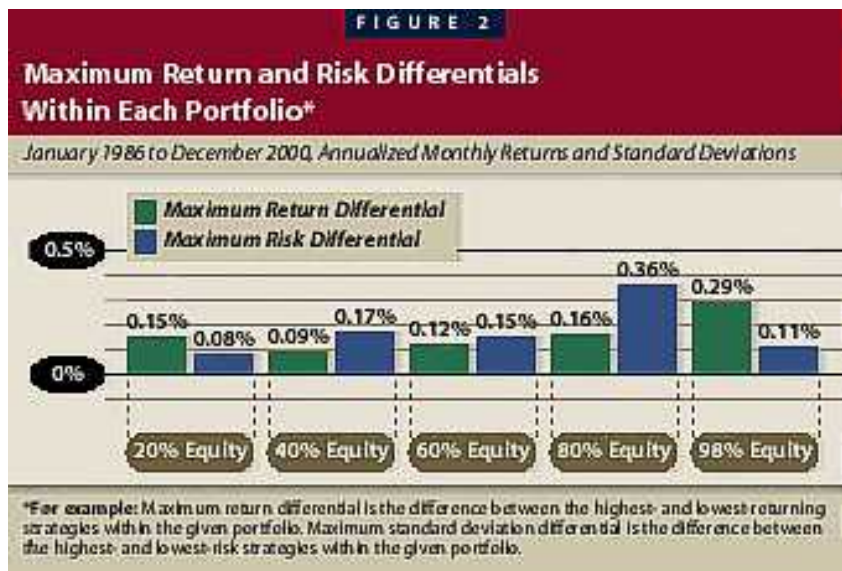


What happens during a devastating event? In the October 1987 market crash, two of the never-rebalanced portfolios performed significantly worse than the benchmarks. The 40 percent equity portfolio lagged by 2.01 percentage points and the 60 percent equity portfolio by 1.61 percentage points—big underperformances given a time period of only one month. Both these portfolios were about ten percentage points overweighted in equity at the beginning of the month. Differences were much less significant for the lowest risk portfolio—fixed income was comparatively unaffected by the crash—and the two portfolios most dominated by equity, since stocks fell across the board.

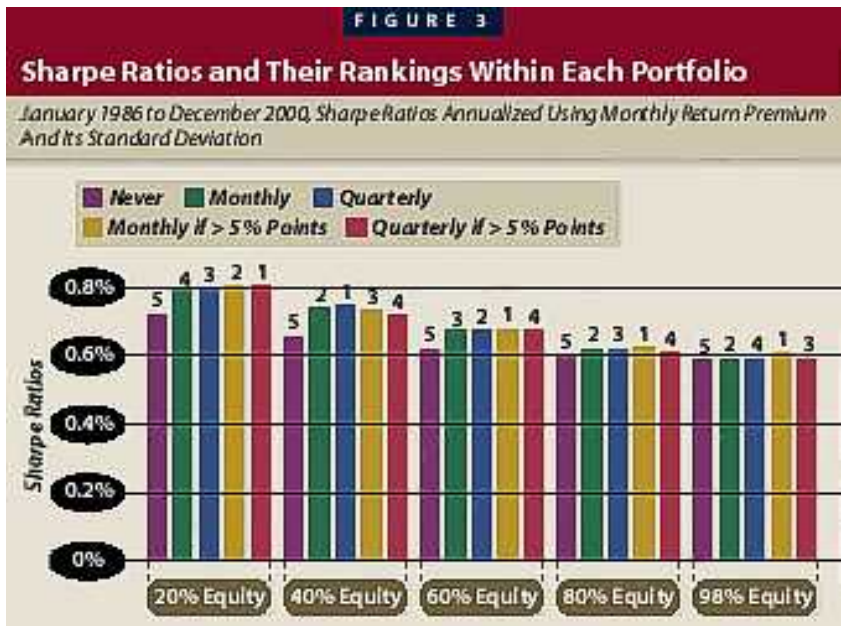
Four Rebalancing Strategies

The study also backtested the four rebalancing strategies outlined at the beginning of this article. Two of the strategies rebalance portfolios regularly at monthly or quarterly intervals. These strategies are easy to implement given most advisors' reporting systems, but involve numerous transactions. In the other two strategies, portfolios are evaluated monthly or quarterly, and rebalancing is triggered by a drift of more than five percentage points in any asset class.

Surprisingly, the four strategies produce similar risks and returns. Figure 2 illustrates the differences between the highest- and lowest-returning strategies within the same portfolio. The biggest difference in return is just 29 basis points a year and differences range down to a low of 9 basis points. Similarly, the maximum risk differential ranges from 8 basis points to just 36 basis points.



Moreover, no one strategy is optimal across all the portfolios. Figure 3 shows the Sharpe ratios of different rebalancing strategies and their rankings in each of the portfolios. As discussed earlier, never-rebalanced portfolios uniformly have the lowest Sharpe ratios. However, that is where the pattern ends; none of the rebalancing strategies consistently yields a top-ranking Sharpe ratio.



Prior studies were able to present conclusions because they only looked at one risk profile, such as 60 percent stocks/40 percent bonds. Because there was only one set of results, it was easy to rank the results and recommend an optimal rebalancing strategy. For example, looking at only the 60 percent equity portfolio, one might conclude that rebalancing, only if month-end allocations in any asset class are off by five percentage points, yields the highest Sharpe ratio. However, this strategy ranks third in the 40 percent equity portfolio, just one risk profile away.

Note that Figure 3 shows that the 98 percent equity portfolio does not benefit as much from rebalancing as do the other portfolios. Although the never-rebalance bar is slightly lower than the other bars, the difference is very small. The difference is also small, though somewhat larger, in the 80 percent equity portfolio. The reason is that rebalancing works best when asset classes do not move in sync with one another. In a world of "what goes up must come down,"

a winning position is trimmed before its downturn and a losing position is boosted before its upturn. (Note that "loser" does not necessarily imply a negative-returning asset. It could be an asset class that has a lower return than others.) However, equities—even those in different asset classes—tend to move together. Thus, the two riskiest portfolios dominated by equity holdings tend to benefit the least because readjusting weights before an equity downturn does not do much to soften the overall impact. However, there is still some benefit to rebalancing even in these cases, since the correlation between equity asset classes is not perfect.

Choosing a Rebalancing Strategy

All four rebalancing strategies have similar returns, risks and Sharpe ratios. No strategy has a consistently superior Sharpe ratio across different risk profiles. This implies that advisors should consider other criteria when deciding which rebalancing method to adopt. The following are some practical issues to consider.

One of the most important issues to consider is the frequency of transactions. There are two concerns: transaction costs and taxes. Investors in fee-based programs are not concerned about transaction costs, but transactions-based accounts, by definition, benefit from reducing the amount of trading. Tax considerations are also paramount. During rebalancing, assets with higher returns are trimmed while low-returning positions are boosted. Depending on the original cost basis, rebalancing the portfolio will likely trigger capital gains taxes as portions of higher-returning assets are sold.

Detailed assumptions about tax implications and transactions costs are outside the scope of this study. However, we can make some helpful inferences from the number of rebalances produced by different strategies. Table 3 demonstrates that the strategies that make rebalancing conditional to the portfolio drifting—the two columns on the right of the table—actually trigger very few rebalances over the past 15 years, especially when compared with their mandatory-rebalancing counterparts. In fact, the number of transactions is surprisingly small for both of these strategies. The monthly conditional strategy triggers just ten rebalances over 15 years in the 98 percent equity portfolio, and the other portfolios have even fewer rebalances.

TABLE 3

Number of Rebalances in Each Strategy

January 1986 to December 2000

	Monthly	Quarterly	Monthly if > 5 % Points	Quarterly if > 5 % Points
20% Equity	179	59	4	4
40% Equity	179	59	4	3
60% Equity	179	59	7	6
80% Equity	179	59	7	6
98% Equity	179	59	10	6

All things being equal, one might slightly favor the strategy to rebalance monthly if any weighting is off by five percentage points. Because this strategy checks the portfolio monthly, it catches deviations early—possibly important in times of unusual market volatility—but overall doesn't produce many more transactions than the corresponding quarterly strategy. It also produces slightly better Sharpe ratios than the quarterly strategy in all but the lowest risk portfolio, as seen in Figure 3. Still, the performance and risk differentials are very small, and either of the conditional strategies would be appropriate for transaction-sensitive investors.

Integrating a rebalancing strategy into existing systems technology is another important point to consider. When an advisor has a sizable number of accounts under management, it is time-consuming to do manual rebalancing, so an automated system is a necessity. The first two methods of rebalancing happen regularly on a monthly or quarterly basis. The regularity and the fact that there is no need to determine how much holdings have drifted make systems programming easier. The latter two methods rely on a percentage-point trigger, so programming is more complicated. Detailed discussion of such methods is outside the scope of this article. However, the results of this study imply that

the risk/return characteristics of various strategies need not be the first concern of advisors when integrating strategies into their systems technology.

Conclusion

Portfolios should be periodically rebalanced. This paper shows that neglecting rebalancing produces the lowest Sharpe ratios across a wide range of risk profiles. In other words, rewards are small or nonexistent compared with the additional risk taken on from increased equity exposure.

However, once an advisor and client have made the decision to rebalance, it does not matter much which strategy they adopt. Of the four rebalancing strategies examined here, no one is consistently better across portfolios of differing risk profiles. A strategy that has the highest Sharpe ratio rank in one risk profile may not have the same rank in the next. Furthermore, any differences are small: All rebalancing strategies analyzed in this study produce similar returns, risks and Sharpe ratios.

The results of this study imply that the risk/return characteristics of the rebalancing strategies should have a fairly low priority on the list of considerations when choosing a strategy. Rather, advisors should first look to investors' sensitivity to transaction frequency and taxes, and to their own programming and systems limitations. Transaction-sensitive investors would do better using one of the strategies triggered by deviations from the allocation; others would do fine with any of the strategies studied.

References

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Appendix: Data Sources

Data are from Morningstar Principia Pro. They are:

- Large Cap: Standard & Poor's 500
- Small/Mid Cap: Wilshire 4500
- International Equity: Morgan Stanley Capital International Europe, Australasia, Far East (MSCI EAFE)
- Real Estate: Wilshire REIT
- Domestic Bond: Lehman Brothers Aggregate Bond
- High Yield Bond: Credit Suisse First Boston High-Yield Bond
- T-Bill: 3-Month Treasury bill