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Resolving the Rebalancing Riddle for Institutional Clients



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Key Highlights

- We tested various rebalancing rules and approaches across different portfolio types and time periods.
- Systematic rebalancing can potentially improve a portfolio's information ratio across portfolio types, often improving both risk and return metrics.
- Scheduled calendar-based rebalancing drove much of the information ratio improvement while being easy to implement.
- Drift-based rules have the potential to create significant additional value and risk mitigation, albeit requiring more focus and attention than scheduled calendar-based approaches.
- Institutional portfolios often comprise less liquid assets, like hedged strategies and private investments. To account for this, we combine illiquid assets with their liquid counterparts for purposes of rebalancing, which we believe to be a best practice due to similar underlying exposures.
- We recommend implementing an annual rebalance combined with a drift-based rule, as summarized in the table below for the various portfolio types.

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RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Summary: Recommended Rebalancing Approaches

	Endowments and Foundations				Ultra High Net Worth		
	(operating) Annual + 20% All Buffer Trigger	(less private investments) Annual + 20% All Buffer Trigger	(more private investments) Annual + 20% All Buffer Trigger	Pensions Annual + 10% Equity Buffer Trigger	Taft-Hartley Annual + 10% Equity Buffer Trigger	(conservative) Annual + 20% All Buffer Trigger	(market growth) Annual + 20% All Buffer Trigger
Recommended Rebalancing Strategy	5.64%	5.60%	6.15%	5.86%	9.00%	4.92%	5.60%
Annualized Return Recommended Rebalance	5.26%	5.40%	6.05%	5.62%	9.29%	4.65%	5.40%
Annualized Volatility Recommended Rebalance	7.67%	9.06%	11.98%	9.72%	11.62%	5.61%	9.06%
Annualized Volatility Unrebalanced	7.82%	9.30%	12.06%	9.95%	12.93%	5.83%	9.30%
Information Ratio Recommended Rebalance	0.74	0.62	0.51	0.60	0.78	0.88	0.62
Information Ratio Unrebalanced	0.67	0.58	0.50	0.56	0.72	0.80	0.58
Average Annual Number of Rebalances	1.1	1.1	1.3	1.1	1.1	1.1	1.1
Return Enhancement	Y	Y	Y	Y	N	Y	Y
Volatility Reduction	Y	Y	Y	Y	Y	Y	Y
Information Ratio Enhancement	Y	Y	Y	Y	Y	Y	Y

Note: Results in the table above were analyzed using data from Dec 31, 2010 - Dec. 31, 2020. Additional details about the methodology used to obtain these results is provided in subsequent pages of this paper.

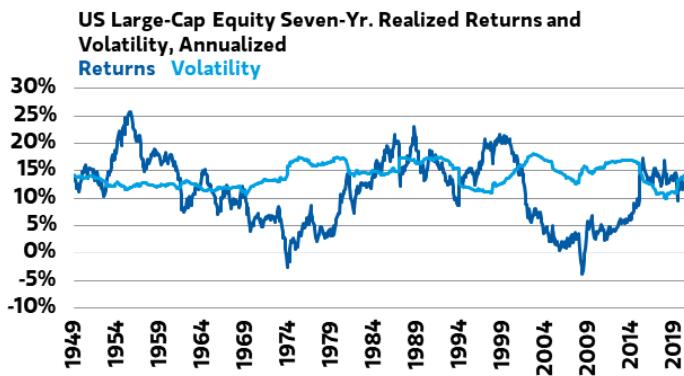
Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Introduction

Investors spend a considerable amount of time and effort constructing strategic asset allocations in order to seek to optimize a portfolio's risk and return objectives. Not spending the time to develop a sound and intentional rebalancing strategy can undermine these efforts.

Asset class risk is generally more stable through time and thus easier to forecast, while estimated realized returns are more volatile and less certain. It is why we argue that rebalancing portfolios is largely an exercise in risk management, as it leads to more certain portfolio risk characteristics over time. Improvements in portfolio returns from rebalancing are not necessarily expected, although they may be achieved, as in many historical scenarios. As markets tend to revert to the mean, rebalancing may be expected to enhance returns; however, even when markets don't mean-revert, the risk may be mitigated enough to improve risk-adjusted returns, despite lower returns in nonrebalanced scenarios.

Risk Has Been Easier to Forecast Than Returns



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Portfolios that are not rebalanced may lose their diversification benefits over time. This was evident in the last decade as US equities, driven by large-cap growth stocks, greatly outperformed other markets. As outperforming asset classes appreciate in value, they account for higher weights in the portfolio. Left unchecked, the more time that passes or the larger percentage that the portfolio's assets deviate from original allocation and intended design, the worse risk-adjusted performance the portfolio will potentially experience.

During times of strong market moves, up or down, the question of whether to buy or sell becomes more imperative, as it did through the COVID-19 sell-off and the strong rebound. To address this question for institutional clients, we explored the performance differentials between rebalancing on a calendar schedule or with a target allocation "drift trigger" (an amount the allocation has moved from the initial target) and not rebalancing.

We segmented portfolios by client types across endowments and foundations (E&F), pensions and ultra high net worth (UHNW) to set target asset allocations according to model policy portfolios based on those defined in our colleagues' publication, "[Policy Portfolios: Empowering Long-Term Thinking and Tactical Flexibility](#)," by Shalett, Hunt and Edwards. For the purpose of our analysis, we grouped asset classes into four categories and used a proxy index to represent the risk and return data for those categories: equities (MSCI All Country World Index, Russell 3000 for Taft-Hartley); fixed income (Bloomberg Barclays US Aggregate); hedged strategies (HFRX); and real assets (S&P Real Assets). We ran scenarios across multiple discrete periods, using various rebalancing policies, and compared those outputs with portfolios that were not rebalanced. Specifically, we sought to determine whether rebalancing is beneficial and, if so, which approach is more advantageous.

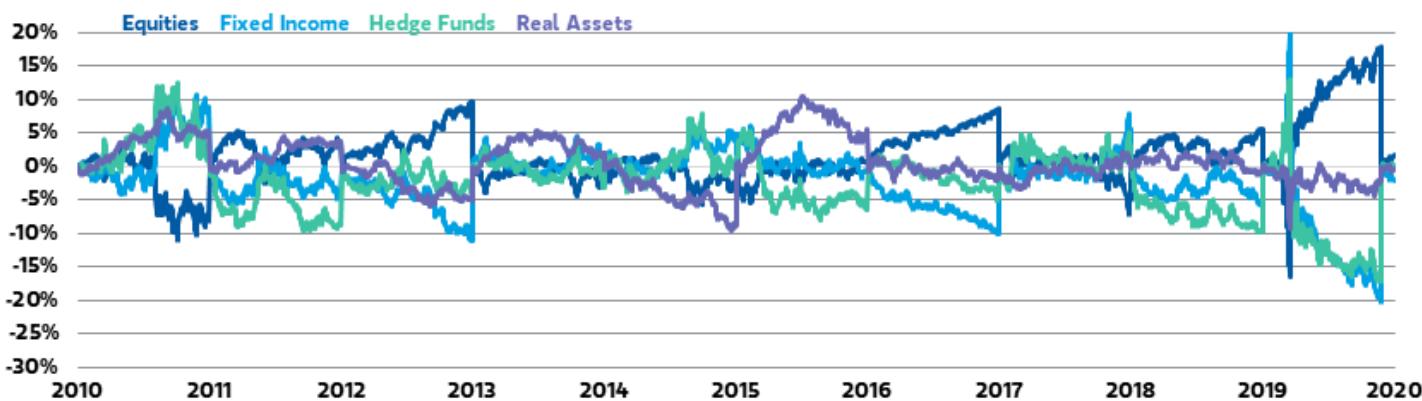
Rebalancing Scenarios and Observations

When observing the effectiveness of a rebalancing strategy, the information ratio, which is the ratio of excess-to-benchmark returns and tracking error, serves as a useful metric. While improving returns are certainly the ultimate goal, being mindful of how much relative risk is being assumed to achieve those returns is paramount to portfolio construction. Since rebalancing portfolios incurs transaction costs, time and, for taxable investors, potential realized gains and losses, the frequency with which to rebalance must also be weighed in conjunction with the information ratio.

Endowments and Foundations (Operating)

After evaluating 12 rebalancing strategies over seven different periods, the recommended approach is to rebalance at least annually, while implementing a 20% drift trigger on any asset class versus its target. Over a 10-year period, this approach yielded an improvement of 0.38% in annual returns, 0.15% in reduced annual volatility and a 0.07 improvement in the information ratio.

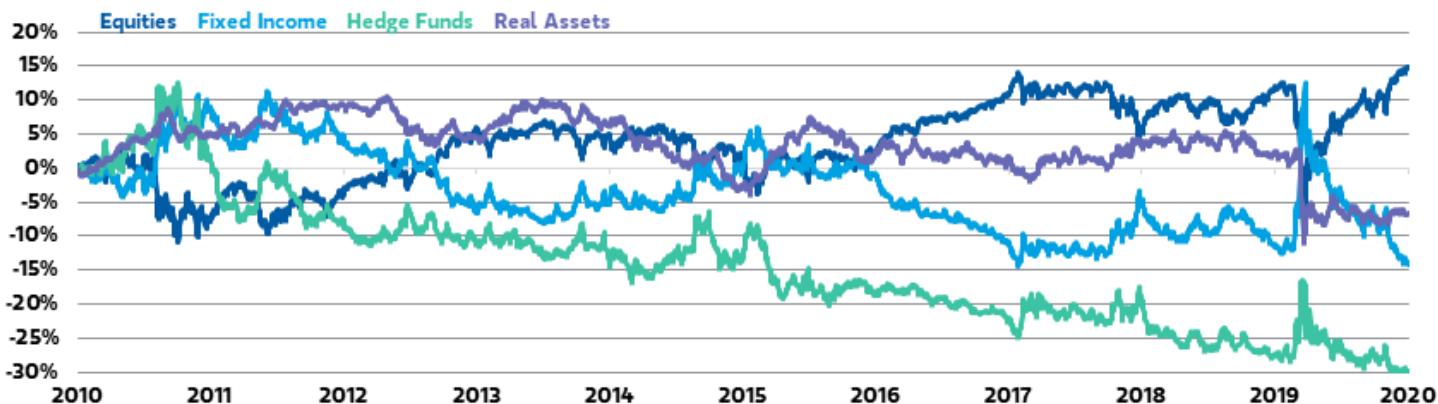
Rebalanced Annually + 20% All Asset Rebalancing Band, Percentage Difference From Target Allocation 50% Equities/40% Fixed Income/5% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 50% Equities/40% Fixed Income/5% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	1	2	0	0	2	3	5
	20% All	1	2	0	0	2	0	1
Monthly + Trigger	10% Equity	2	12	3	11	36	60	120
	20% All	1	11	3	11	35	59	119
Quarterly + Trigger	10% Equity	1	4	1	3	12	20	41
	20% All	1	4	1	3	12	20	40
Annual + Trigger	10% Equity	1	2	0	0	4	6	12
	20% All	1	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-17.80%	10.53%	-9.33%	-6.65%	6.32%	7.12%	5.26%
Monthly		-18.54%	11.11%	-9.46%	-6.58%	6.62%	7.16%	5.37%
Quarterly		-17.80%	11.60%	-9.35%	-6.57%	6.77%	7.25%	5.42%
Annual		-17.80%	10.53%	-9.33%	-6.65%	6.41%	7.08%	5.32%
Daily Target	10% Equity	-18.69%	12.71%	-9.33%	-6.65%	6.95%	7.47%	5.49%
	20% All	-18.22%	14.14%	-9.33%	-6.65%	7.38%	7.12%	5.24%
Monthly + Trigger	10% Equity	-18.82%	11.91%	-9.46%	-6.58%	6.86%	7.31%	5.44%
	20% All	-18.54%	11.11%	-9.46%	-6.58%	6.62%	7.16%	5.37%
Quarterly + Trigger	10% Equity	-18.69%	12.24%	-9.35%	-6.57%	6.97%	7.37%	5.49%
	20% All	-18.22%	12.80%	-9.35%	-6.57%	7.14%	7.47%	5.53%
Annual + Trigger	10% Equity	-18.69%	12.71%	-9.33%	-6.65%	7.08%	7.49%	5.55%
	20% All	-18.22%	14.14%	-9.33%	-6.65%	7.51%	7.75%	5.64%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

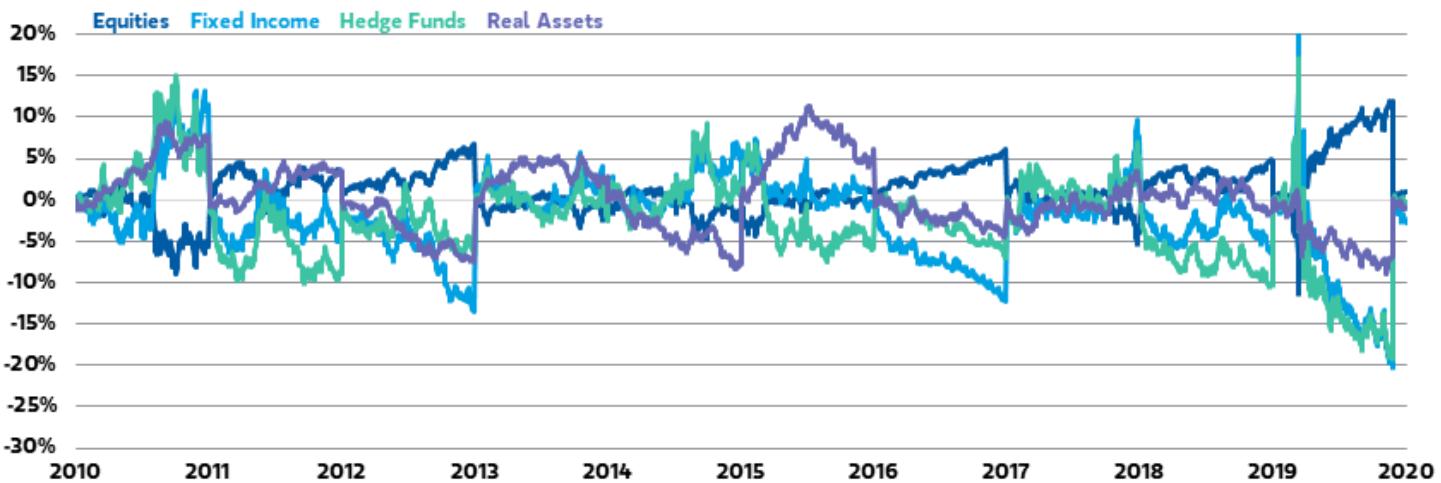
Risk	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		28.45%	13.22%	7.93%	6.54%	9.09%	8.37%	7.82%
Monthly		30.19%	13.98%	8.07%	6.53%	9.43%	8.03%	7.60%
Quarterly		28.45%	13.63%	7.95%	6.51%	9.26%	7.90%	7.53%
Annual		28.45%	13.22%	7.93%	6.54%	9.08%	7.79%	7.45%
Daily Target	10% Equity	30.63%	14.32%	7.93%	6.54%	9.60%	8.13%	7.77%
	20% All	29.13%	14.44%	7.93%	6.54%	9.67%	8.37%	7.73%
Monthly + Trigger	10% Equity	30.62%	14.28%	8.07%	6.53%	9.58%	8.13%	7.65%
	20% All	30.19%	13.98%	8.07%	6.53%	9.43%	8.03%	7.60%
Quarterly + Trigger	10% Equity	30.63%	14.28%	7.95%	6.51%	9.58%	8.13%	7.66%
	20% All	29.13%	14.06%	7.95%	6.51%	9.47%	8.05%	7.61%
Annual + Trigger	10% Equity	30.63%	14.32%	7.93%	6.54%	9.63%	8.17%	7.70%
	20% All	29.13%	14.44%	7.93%	6.54%	9.68%	8.21%	7.67%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Endowments and Foundations (Less Private Investments)

After evaluating 12 rebalancing strategies through seven different periods, the recommended approach is to rebalance at least annually while implementing a 20% drift trigger on any asset class versus its target. Over a 10-year period, this approach yielded an improvement of 0.20% in annual return, 0.24% in reduced annual volatility and a 0.04 improvement in the information ratio.

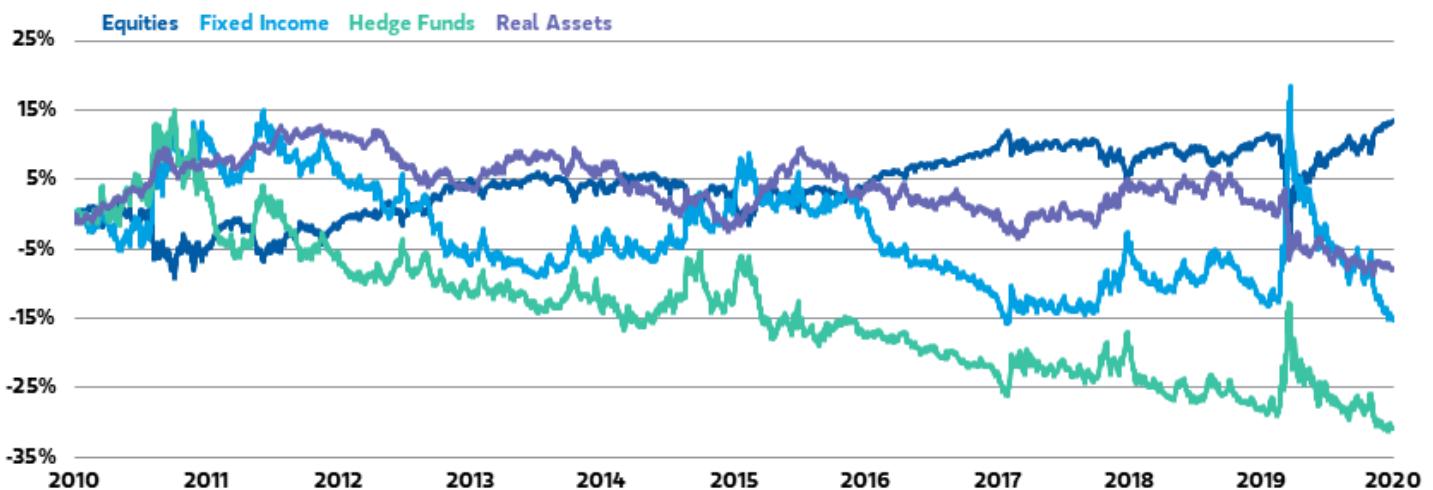
Rebalanced Annually + 20% All Asset Rebalancing Band, Percentage Difference From Target Allocation 60% Equities/20% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 60% Equities/20% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

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Number of Rebalances

Rebalance	Band	Feb. 19, '20-Mar. 23, '20	Dec. 31, '19-Dec. 31, '20	Sept. 20, '18-Dec. 24, '18	Dec. 29, '17-Dec. 31, '18	Dec. 29, '17-Dec. 31, '20	Dec. 31, '15-Dec. 31, '20	Dec. 31, '10-Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	1	2	0	0	2	1	3
	20% All	1	2	0	0	2	1	3
Monthly + Trigger	10% Equity	1	11	3	11	35	59	119
	20% All	2	12	3	11	36	60	120
Quarterly + Trigger	10% Equity	1	4	1	3	12	20	40
	20% All	1	4	1	3	12	20	40
Annual + Trigger	10% Equity	1	2	0	0	4	6	11
	20% All	1	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20-Mar. 23, '20	Dec. 31, '19-Dec. 31, '20	Sept. 20, '18-Dec. 24, '18	Dec. 29, '17-Dec. 31, '18	Dec. 29, '17-Dec. 31, '20	Dec. 31, '15-Dec. 31, '20	Dec. 31, '10-Dec. 31, '20
Unrebalanced		-22.46%	11.23%	-11.27%	-7.89%	6.34%	7.57%	5.40%
Monthly		-23.06%	11.68%	-11.36%	-7.80%	6.58%	7.58%	5.45%
Quarterly		-22.46%	12.04%	-11.29%	-7.82%	6.68%	7.63%	5.48%
Annual		-22.46%	11.23%	-11.27%	-7.89%	6.42%	7.51%	5.38%
Daily Target	10% Equity	-22.93%	13.32%	-11.27%	-7.89%	7.02%	7.54%	5.51%
	20% All	-22.93%	13.65%	-11.27%	-7.89%	6.99%	7.53%	5.48%
Monthly + Trigger	10% Equity	-23.06%	11.68%	-11.36%	-7.80%	6.58%	7.58%	5.45%
	20% All	-23.15%	12.63%	-11.36%	-7.80%	6.87%	7.76%	5.53%
Quarterly + Trigger	10% Equity	-22.93%	12.73%	-11.29%	-7.82%	6.89%	7.75%	5.54%
	20% All	-22.93%	12.73%	-11.29%	-7.82%	6.89%	7.75%	5.54%
Annual + Trigger	10% Equity	-22.93%	13.32%	-11.27%	-7.89%	7.05%	7.89%	5.57%
	20% All	-22.93%	13.65%	-11.27%	-7.89%	7.15%	7.96%	5.60%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

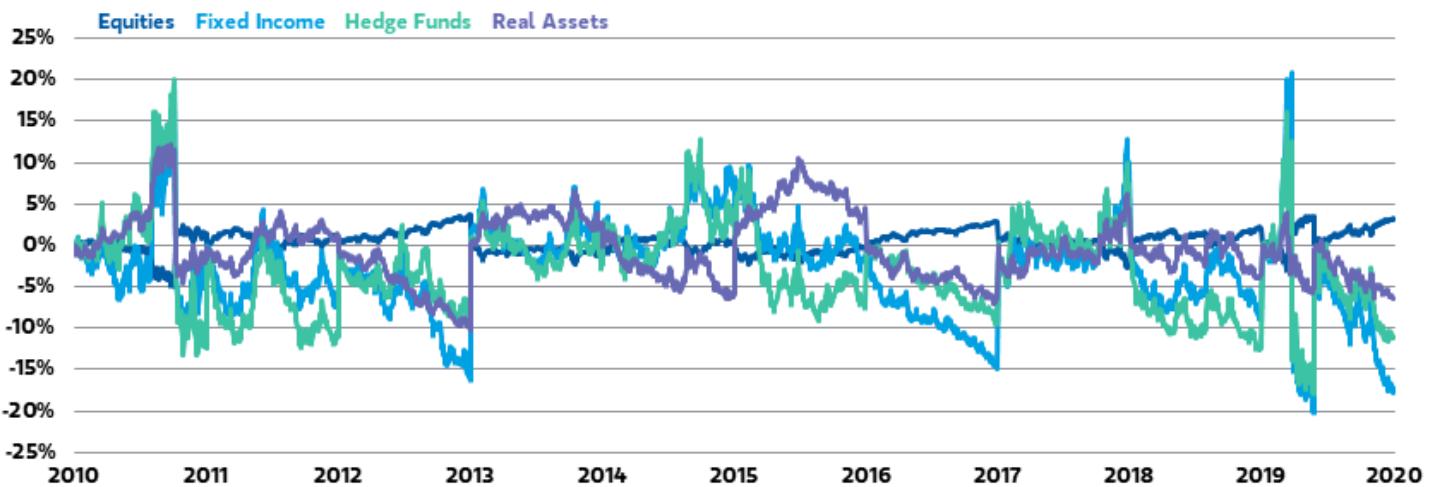
Risk	Band	Feb. 19, '20-Mar. 23, '20	Dec. 31, '19-Dec. 31, '20	Sept. 20, '18-Dec. 24, '18	Dec. 29, '17-Dec. 31, '18	Dec. 29, '17-Dec. 31, '20	Dec. 31, '15-Dec. 31, '20	Dec. 31, '10-Dec. 31, '20
Unrebalanced		34.69%	16.04%	9.35%	7.64%	10.95%	9.91%	9.30%
Monthly		36.38%	16.74%	9.49%	7.64%	11.20%	9.52%	8.98%
Quarterly		34.69%	16.38%	9.38%	7.62%	11.03%	9.39%	8.91%
Annual		34.69%	16.04%	9.35%	7.64%	10.89%	9.30%	8.83%
Daily Target	10% Equity	36.66%	17.13%	9.35%	7.64%	11.36%	9.90%	9.06%
	20% All	36.66%	17.27%	9.35%	7.64%	11.49%	9.90%	9.10%
Monthly + Trigger	10% Equity	36.38%	16.74%	9.49%	7.64%	11.20%	9.52%	8.98%
	20% All	36.44%	16.96%	9.49%	7.64%	11.31%	9.59%	9.02%
Quarterly + Trigger	10% Equity	36.66%	17.00%	9.38%	7.62%	11.34%	9.60%	9.02%
	20% All	36.66%	17.00%	9.38%	7.62%	11.34%	9.60%	9.02%
Annual + Trigger	10% Equity	36.66%	17.13%	9.35%	7.64%	11.43%	9.68%	9.04%
	20% All	36.66%	17.27%	9.35%	7.64%	11.50%	9.73%	9.06%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Endowments and Foundations (More Private Investments)

After evaluating 12 rebalancing strategies through seven different periods, the recommended approach is to rebalance at least annually while implementing a 20% drift trigger on any asset class versus its target. This approach over a 10-year period yielded an improvement of 0.10% in annual return, 0.08% in reduced annual volatility and a 0.01 improvement in the information ratio.

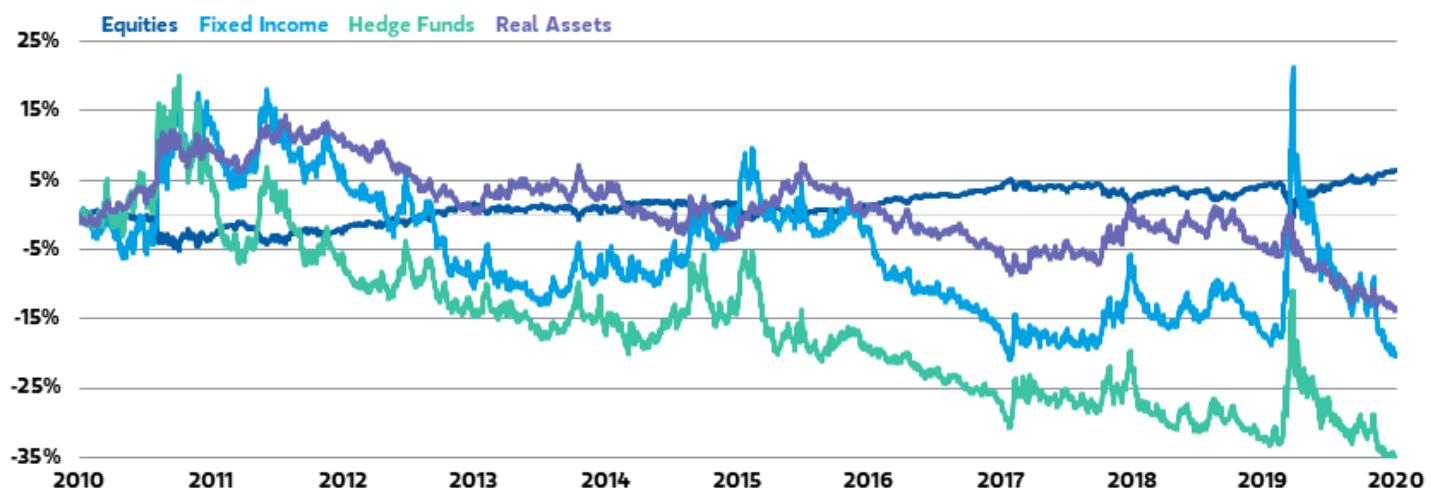
Rebalanced Annually + 20% All Asset Rebalancing Band, Percentage Difference From Target Allocation 75% Equities/5% Fixed Income/5% Hedge Funds/15% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 75% Equities/5% Fixed Income/5% Hedge Funds/15% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

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Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	0	0	0	0	0	0	0
	20% All	1	3	0	0	2	4	5
Monthly + Trigger	10% Equity	1	11	3	11	35	59	119
	20% All	2	12	3	11	36	60	120
Quarterly + Trigger	10% Equity	0	3	1	3	11	19	39
	20% All	1	5	1	3	13	21	42
Annual + Trigger	10% Equity	0	0	0	0	2	4	9
	20% All	1	3	0	0	5	7	13

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-29.88%	11.66%	-13.92%	-9.55%	6.76%	8.68%	6.05%
Monthly		-30.11%	11.78%	-13.97%	-9.49%	6.86%	8.69%	6.07%
Quarterly		-29.88%	11.91%	-13.93%	-9.50%	6.89%	8.71%	6.09%
Annual		-29.88%	11.66%	-13.92%	-9.55%	6.80%	8.67%	6.06%
Daily Target	10% Equity	-29.88%	11.66%	-13.92%	-9.55%	6.76%	8.68%	6.05%
	20% All	-30.14%	12.44%	-13.92%	-9.55%	6.98%	8.82%	6.12%
Monthly + Trigger	10% Equity	-30.11%	11.78%	-13.97%	-9.49%	6.86%	8.69%	6.07%
	20% All	-30.17%	12.08%	-13.97%	-9.49%	6.95%	8.75%	6.10%
Quarterly + Trigger	10% Equity	-29.88%	11.91%	-13.93%	-9.50%	6.89%	8.71%	6.09%
	20% All	-30.14%	12.22%	-13.93%	-9.50%	6.98%	8.77%	6.12%
Annual + Trigger	10% Equity	-29.88%	11.66%	-13.92%	-9.55%	6.80%	8.67%	6.06%
	20% All	-30.14%	12.44%	-13.92%	-9.55%	7.04%	8.81%	6.15%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

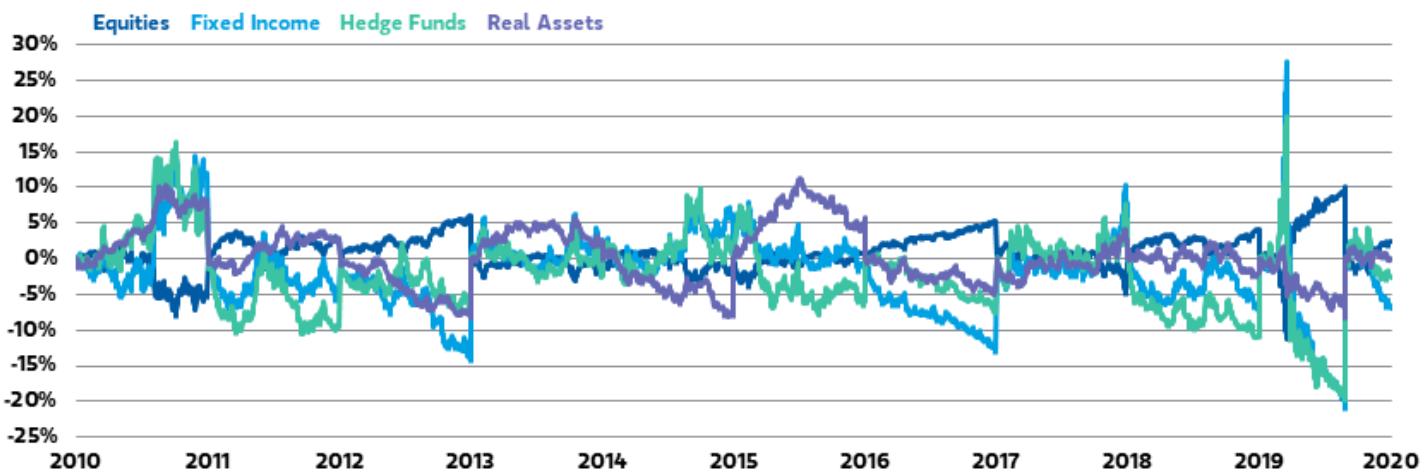
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Unrebalanced		48.78%	22.37%	12.09%	9.89%	14.88%	12.88%	12.06%
Monthly		49.61%	22.66%	12.16%	9.88%	14.99%	12.71%	11.93%
Quarterly		48.78%	22.49%	12.10%	9.88%	14.90%	12.65%	11.89%
Annual		48.78%	22.37%	12.09%	9.89%	14.85%	12.62%	11.85%
Daily Target	10% Equity	48.78%	22.37%	12.09%	9.89%	14.88%	12.88%	12.06%
	20% All	49.70%	22.88%	12.09%	9.89%	15.09%	12.75%	12.03%
Monthly + Trigger	10% Equity	49.61%	22.66%	12.16%	9.88%	14.99%	12.71%	11.93%
	20% All	49.77%	22.78%	12.16%	9.88%	15.05%	12.76%	11.95%
Quarterly + Trigger	10% Equity	48.78%	22.49%	12.10%	9.88%	14.90%	12.65%	11.89%
	20% All	49.70%	22.81%	12.10%	9.88%	15.06%	12.76%	11.95%
Annual + Trigger	10% Equity	48.78%	22.37%	12.09%	9.89%	14.85%	12.62%	11.85%
	20% All	49.70%	22.88%	12.09%	9.89%	15.11%	12.80%	11.98%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Pensions (Other)

After evaluating 12 rebalancing strategies through seven different periods, the recommended approach is to rebalance at least annually while implementing a 10% drift trigger on any asset class vs. its target. Over a 10-year period, this approach yielded an improvement of 0.24% in annual return, 0.23% in reduced annual volatility and a 0.04 improvement in the information ratio.

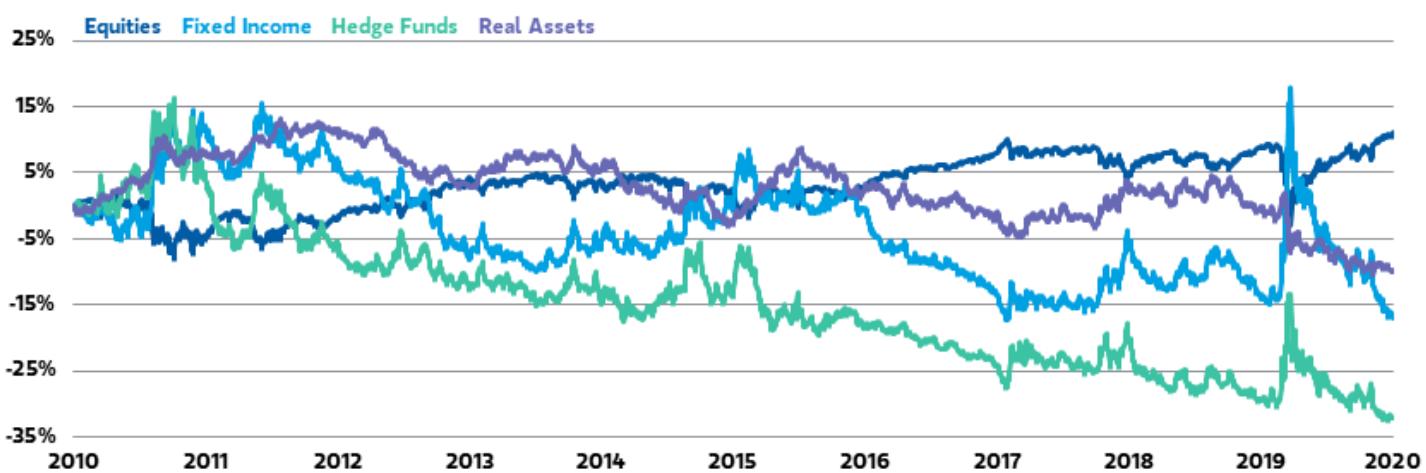
Rebalanced Annually + 10% Equity Rebalancing Band, Percentage Difference From Target Allocation 65% Equities/20% Fixed Income/10% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 65% Equities/20% Fixed Income/10% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	1	2	0	0	2	0	1
	20% All	1	2	0	0	2	1	3
Monthly + Trigger	10% Equity	1	11	3	11	35	59	119
	20% All	2	12	3	11	36	60	120
Quarterly + Trigger	10% Equity	1	4	1	3	12	20	40
	20% All	1	4	1	3	12	20	40
Annual + Trigger	10% Equity	1	2	0	0	4	6	11
	20% All	1	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-23.74%	11.58%	-11.89%	-8.25%	6.57%	7.90%	5.62%
Monthly		-24.31%	12.02%	-11.98%	-8.17%	6.81%	7.92%	5.68%
Quarterly		-23.74%	12.38%	-11.91%	-8.18%	6.91%	7.97%	5.72%
Annual		-23.74%	11.58%	-11.89%	-8.25%	6.64%	7.85%	5.63%
Daily Target	10% Equity	-24.21%	14.21%	-11.89%	-8.25%	7.30%	7.90%	5.60%
	20% All	-24.21%	13.75%	-11.89%	-8.25%	7.16%	7.84%	5.70%
Monthly + Trigger	10% Equity	-24.31%	12.02%	-11.98%	-8.17%	6.81%	7.92%	5.68%
	20% All	-24.41%	12.93%	-11.98%	-8.17%	7.09%	8.09%	5.77%
Quarterly + Trigger	10% Equity	-24.21%	13.45%	-11.91%	-8.18%	7.24%	8.17%	5.82%
	20% All	-24.21%	13.02%	-11.91%	-8.18%	7.10%	8.09%	5.78%
Annual + Trigger	10% Equity	-24.21%	14.21%	-11.89%	-8.25%	7.45%	8.34%	5.86%
	20% All	-24.21%	13.75%	-11.89%	-8.25%	7.31%	8.25%	5.82%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

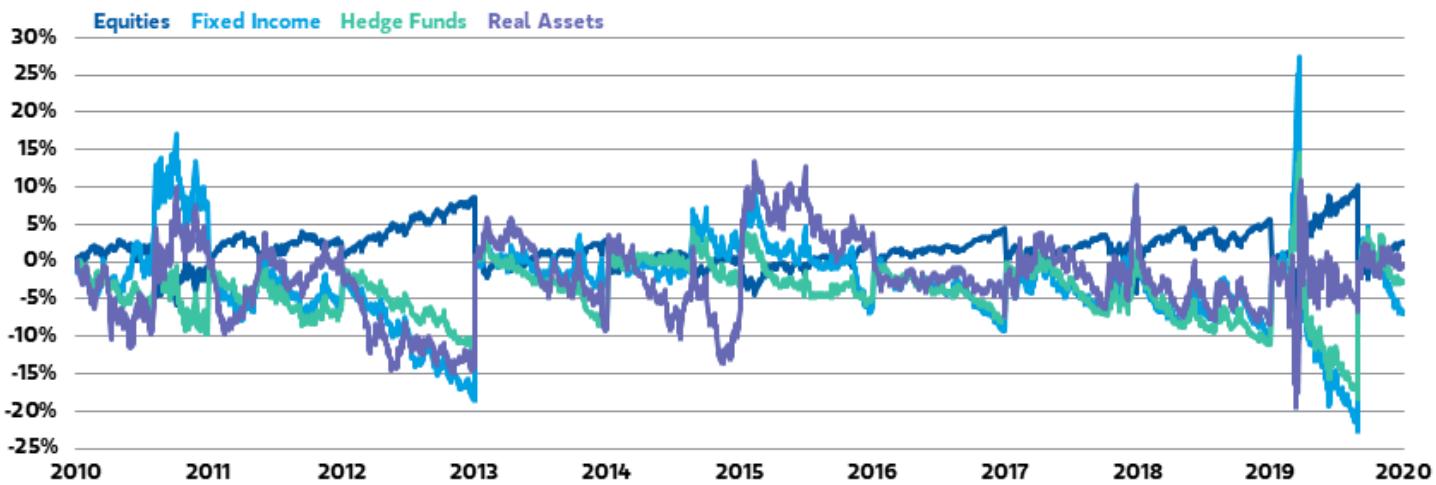
Risk	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		37.77%	17.41%	10.10%	8.25%	11.84%	10.62%	9.95%
Monthly		39.38%	18.08%	10.22%	8.24%	12.10%	10.27%	9.69%
Quarterly		37.77%	17.73%	10.12%	8.23%	11.93%	10.14%	9.62%
Annual		37.77%	17.41%	10.10%	8.25%	11.79%	10.06%	9.55%
Daily Target	10% Equity	39.65%	18.30%	10.10%	8.25%	12.23%	10.62%	9.95%
	20% All	39.65%	18.57%	10.10%	8.25%	12.36%	10.57%	9.80%
Monthly + Trigger	10% Equity	39.38%	18.08%	10.22%	8.24%	12.10%	10.27%	9.69%
	20% All	39.43%	18.29%	10.22%	8.24%	12.21%	10.35%	9.73%
Quarterly + Trigger	10% Equity	39.65%	18.14%	10.12%	8.23%	12.13%	10.29%	9.70%
	20% All	39.65%	18.33%	10.12%	8.23%	12.23%	10.36%	9.73%
Annual + Trigger	10% Equity	39.65%	18.30%	10.10%	8.25%	12.23%	10.37%	9.72%
	20% All	39.65%	18.57%	10.10%	8.25%	12.37%	10.47%	9.77%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Pensions (Taft-Hartley)

After evaluating 12 rebalancing strategies over seven different periods, the recommended approach is to rebalance at least annually while implementing a 10% drift trigger on any asset class versus its target. Over a 10-year period, this approach yielded a reduction of 0.29% in annual return, 1.31% in reduced annual volatility and a 0.06 improvement in the information ratio.

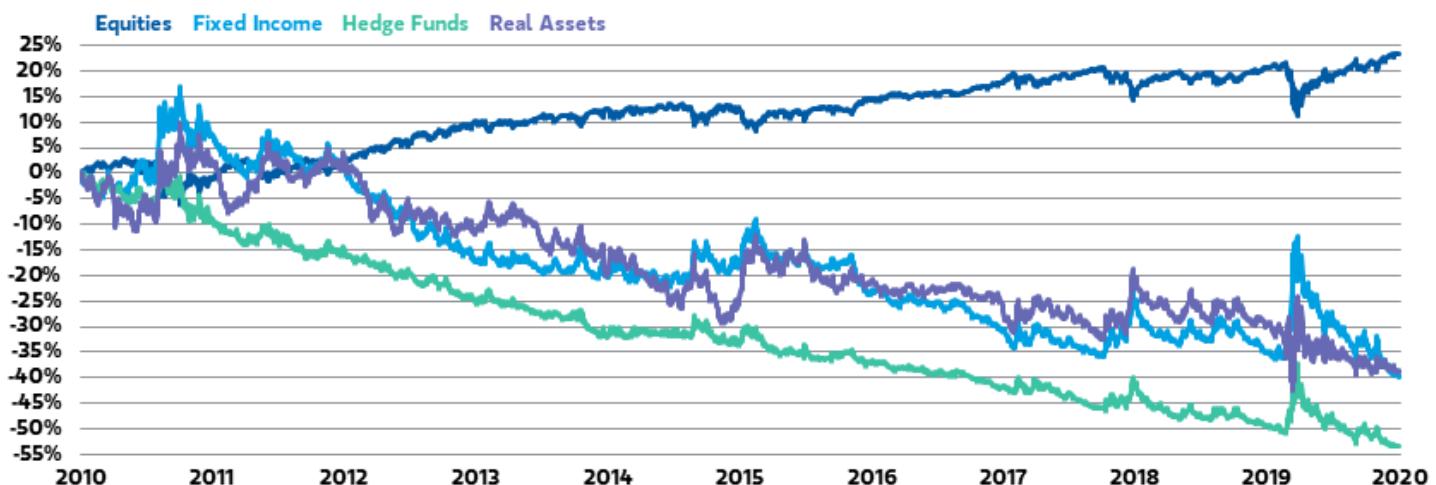
Rebalanced Annually + 10% Equity Rebalancing Band, Percentage Difference From Target Allocation 65% Equities/20% Fixed Income/10% Hedge Funds/5% Real Assets



Note: For equities, Russell 3000 Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 65% Equities/20% Fixed Income/10% Hedge Funds/5% Real Assets



Note: For equities, Russell 3000 Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	1	2	0	0	0	3	2
	20% All	2	2	0	0	3	4	5
Monthly + Trigger	10% Equity	1	11	3	11	35	59	119
	20% All	1	11	3	11	35	59	119
Quarterly + Trigger	10% Equity	1	4	1	3	12	20	40
	20% All	2	4	1	3	12	20	40
Annual + Trigger	10% Equity	1	2	0	0	4	6	11
	20% All	2	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-25.18%	14.42%	-13.78%	-5.23%	9.78%	10.49%	9.29%
Monthly		-25.74%	14.96%	-13.92%	-5.01%	9.99%	10.38%	8.82%
Quarterly		-25.18%	15.44%	-13.78%	-4.93%	10.14%	10.46%	8.89%
Annual		-25.18%	14.42%	-13.78%	-5.23%	9.75%	10.25%	8.77%
Daily Target	10% Equity	-25.46%	16.91%	-13.78%	-5.23%	9.78%	10.85%	8.85%
	20% All	-25.69%	16.43%	-13.78%	-5.23%	10.20%	10.73%	8.96%
Monthly + Trigger	10% Equity	-25.74%	14.96%	-13.92%	-5.01%	9.99%	10.38%	8.82%
	20% All	-25.74%	14.96%	-13.92%	-5.01%	9.99%	10.38%	8.82%
Quarterly + Trigger	10% Equity	-25.46%	16.11%	-13.78%	-4.93%	10.36%	10.59%	8.95%
	20% All	-25.69%	15.88%	-13.78%	-4.93%	10.28%	10.54%	8.93%
Annual + Trigger	10% Equity	-25.46%	16.91%	-13.78%	-5.23%	10.55%	10.72%	9.00%
	20% All	-25.69%	16.43%	-13.78%	-5.23%	10.39%	10.63%	8.96%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

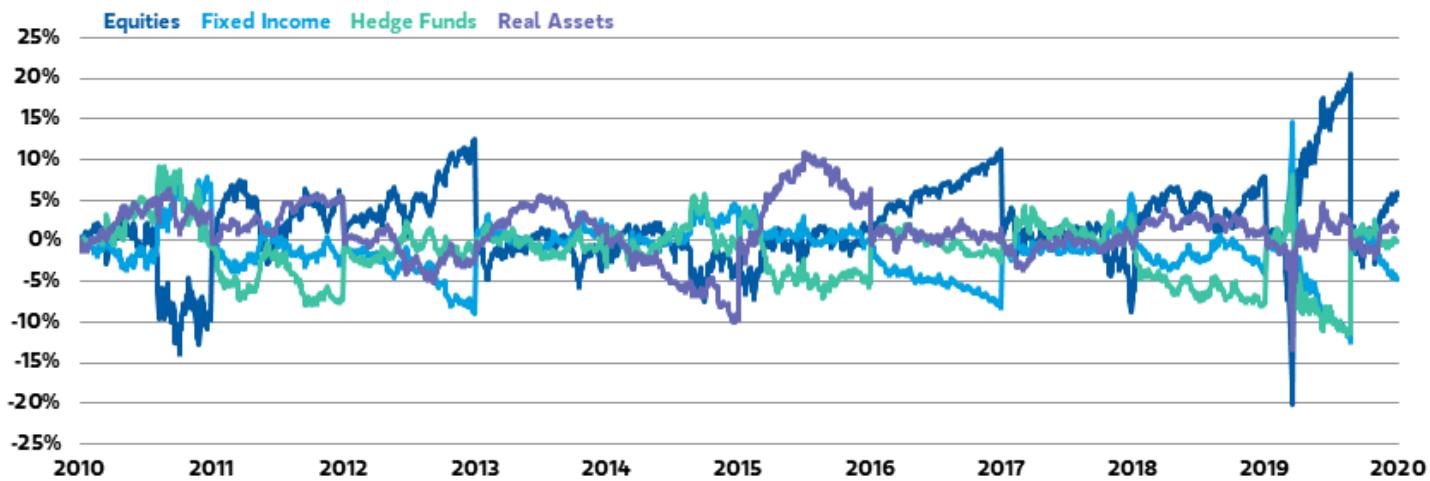
Risk	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		47.48%	21.57%	13.26%	11.08%	15.24%	13.34%	12.93%
Monthly		49.84%	22.27%	13.43%	10.90%	15.11%	12.53%	11.51%
Quarterly		47.48%	21.98%	13.27%	10.88%	14.97%	12.43%	11.46%
Annual		47.48%	21.57%	13.26%	11.08%	14.85%	12.35%	11.44%
Daily Target	10% Equity	50.46%	22.52%	13.26%	11.08%	15.24%	12.85%	11.55%
	20% All	49.95%	22.75%	13.26%	11.08%	15.45%	12.77%	11.82%
Monthly + Trigger	10% Equity	49.84%	22.27%	13.43%	10.90%	15.11%	12.53%	11.51%
	20% All	49.84%	22.27%	13.43%	10.90%	15.11%	12.53%	11.51%
Quarterly + Trigger	10% Equity	50.46%	22.40%	13.27%	10.88%	15.18%	12.58%	11.54%
	20% All	49.95%	22.70%	13.27%	10.88%	15.32%	12.68%	11.60%
Annual + Trigger	10% Equity	50.46%	22.52%	13.26%	11.08%	15.32%	12.68%	11.62%
	20% All	49.95%	22.75%	13.26%	11.08%	15.43%	12.76%	11.66%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Ultra High Net Worth (Conservative Portfolio)

After evaluating 12 rebalancing strategies through seven different periods, the recommended approach is to rebalance at least annually while implementing a 20% drift trigger on any asset class vs. its target. Over a 10-year period, this approach yielded a reduction of 0.27% in annual return, 0.22% in reduced annual volatility and a 0.08 improvement in the information ratio.

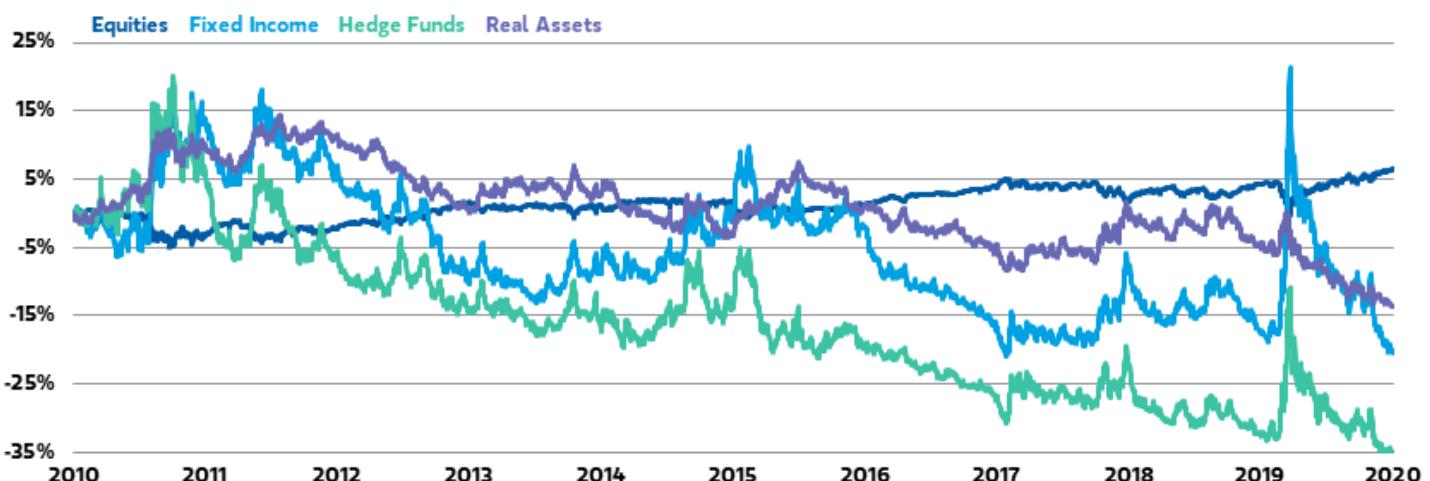
Rebalanced Annually + 20% All Asset Rebalancing Band, Percentage Difference From Target Allocation 35% Equities/45% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 35% Equities/45% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	2	4	0	0	4	4	10
	20% All	1	2	0	0	2	0	3
Monthly + Trigger	10% Equity	2	12	3	11	36	60	120
	20% All	1	11	3	11	35	59	119
Quarterly + Trigger	10% Equity	2	5	1	4	14	22	43
	20% All	1	4	1	3	12	20	40
Annual + Trigger	10% Equity	2	4	0	0	6	9	16
	20% All	1	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-13.44%	9.48%	-7.29%	-5.44%	5.74%	6.15%	4.65%
Monthly		-14.11%	10.02%	-7.39%	-5.36%	6.00%	6.18%	4.72%
Quarterly		-13.44%	10.43%	-7.31%	-5.37%	6.13%	6.24%	4.76%
Annual		-13.44%	9.48%	-7.29%	-5.44%	5.81%	6.10%	4.66%
Daily Target	10% Equity	-14.34%	11.19%	-7.29%	-5.44%	6.28%	6.29%	4.87%
	20% All	-13.82%	12.31%	-7.29%	-5.44%	6.67%	6.15%	4.89%
Monthly + Trigger	10% Equity	-14.48%	10.38%	-7.39%	-5.36%	6.12%	6.25%	4.75%
	20% All	-14.11%	10.02%	-7.39%	-5.36%	6.00%	6.18%	4.72%
Quarterly + Trigger	10% Equity	-14.34%	11.01%	-7.31%	-5.22%	6.36%	6.38%	4.81%
	20% All	-13.82%	11.50%	-7.31%	-5.37%	6.46%	6.44%	4.86%
Annual + Trigger	10% Equity	-14.34%	11.19%	-7.29%	-5.44%	6.34%	6.41%	4.83%
	20% All	-13.82%	12.31%	-7.29%	-5.44%	6.68%	6.63%	4.92%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

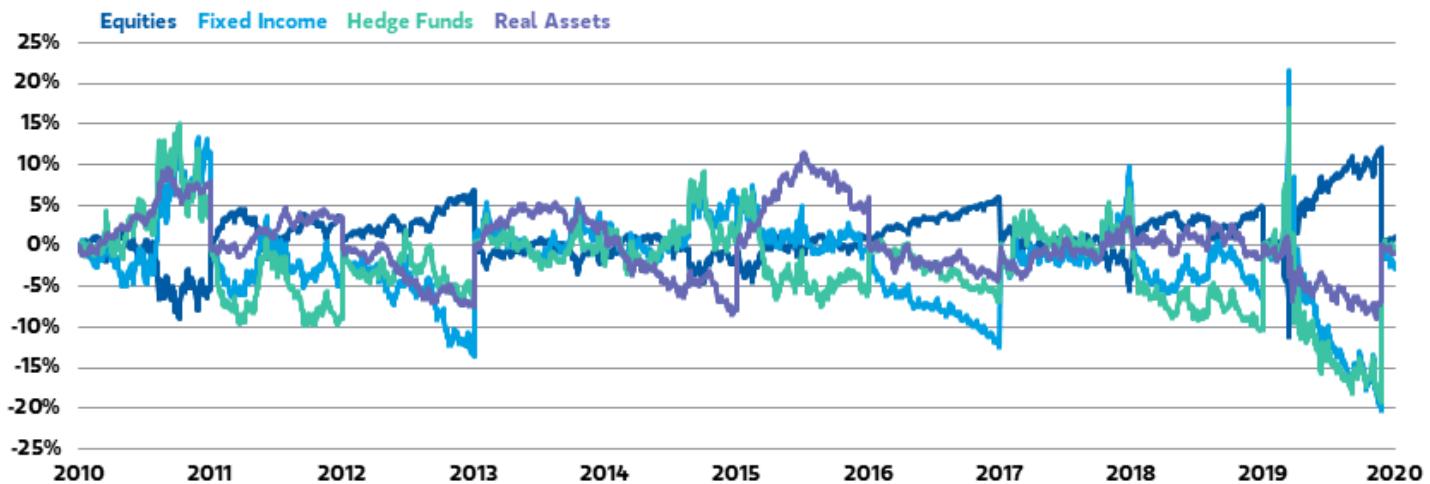
Risk	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		20.09%	9.50%	5.82%	4.83%	6.63%	6.23%	5.83%
Monthly		21.61%	10.15%	5.95%	4.82%	6.89%	5.89%	5.58%
Quarterly		20.09%	9.86%	5.84%	4.81%	6.75%	5.78%	5.52%
Annual		20.09%	9.50%	5.82%	4.83%	6.60%	5.69%	5.45%
Daily Target	10% Equity	22.00%	10.51%	5.82%	4.83%	7.07%	6.06%	5.66%
	20% All	20.68%	10.39%	5.82%	4.83%	7.02%	6.23%	5.60%
Monthly + Trigger	10% Equity	22.74%	10.50%	5.95%	4.82%	7.06%	6.01%	5.64%
	20% All	21.61%	10.15%	5.95%	4.82%	6.89%	5.89%	5.58%
Quarterly + Trigger	10% Equity	22.00%	10.47%	5.84%	4.83%	7.05%	6.00%	5.67%
	20% All	20.68%	10.20%	5.84%	4.81%	6.92%	5.90%	5.59%
Annual + Trigger	10% Equity	22.00%	10.51%	5.82%	4.83%	7.09%	6.03%	5.68%
	20% All	20.68%	10.39%	5.82%	4.83%	7.04%	5.99%	5.61%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Ultra High Net Worth (Market Growth Portfolio)

After evaluating 12 rebalancing strategies through seven different periods, the recommended approach is to rebalance at least annually while implementing a 20% drift trigger on any asset class versus its target. Over a 10-year period, this approach yielded a reduction of 0.20% in annual return, 0.24% in reduced annual volatility and a 0.04 improvement in the information ratio.

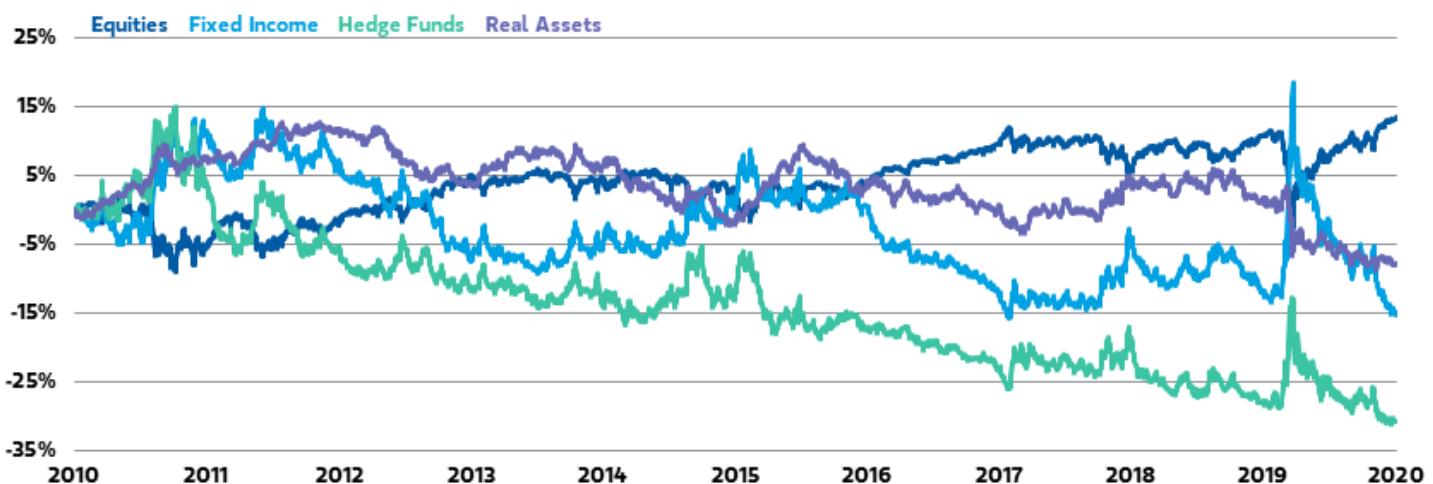
Rebalanced Annually + 20% All Asset Rebalancing Band, Percentage Difference From Target Allocation 60% Equities/20% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

Unrebalanced, Percentage Difference From Target Allocation 60% Equities/20% Fixed Income/15% Hedge Funds/5% Real Assets



Note: For equities, MSCI All Country World Index; for fixed income, Bloomberg Barclays US Aggregate Index; for hedge funds, Hedge Fund Research HFRX Global Index; and for real assets, S&P Real Assets Total Return Index.

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Dec. 31, 2020

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Number of Rebalances

Rebalance	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		0	0	0	0	0	0	0
Monthly		1	11	3	11	35	59	119
Quarterly		0	3	1	3	11	19	39
Annual		0	0	0	0	2	4	9
Daily Target	10% Equity	1	2	0	0	2	1	3
	20% All	1	2	0	0	2	1	3
Monthly + Trigger	10% Equity	1	11	3	11	35	59	119
	20% All	2	12	3	11	36	60	120
Quarterly + Trigger	10% Equity	1	4	1	3	12	20	40
	20% All	1	4	1	3	12	20	40
Annual + Trigger	10% Equity	1	2	0	0	4	6	11
	20% All	1	2	0	0	4	6	11

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Returns

Return	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		-22.46%	11.23%	-11.27%	-7.89%	6.34%	7.57%	5.40%
Monthly		-23.06%	11.68%	-11.36%	-7.80%	6.58%	7.58%	5.45%
Quarterly		-22.46%	12.04%	-11.29%	-7.82%	6.68%	7.63%	5.48%
Annual		-22.46%	11.23%	-11.27%	-7.89%	6.42%	7.51%	5.38%
Daily Target	10% Equity	-22.93%	13.32%	-11.27%	-7.89%	7.02%	7.54%	5.51%
	20% All	-22.93%	13.65%	-11.27%	-7.89%	6.99%	7.53%	5.48%
Monthly + Trigger	10% Equity	-23.06%	11.68%	-11.36%	-7.80%	6.58%	7.58%	5.45%
	20% All	-23.15%	12.63%	-11.36%	-7.80%	6.87%	7.76%	5.53%
Quarterly + Trigger	10% Equity	-22.93%	12.73%	-11.29%	-7.82%	6.89%	7.75%	5.54%
	20% All	-22.93%	12.73%	-11.29%	-7.82%	6.89%	7.75%	5.54%
Annual + Trigger	10% Equity	-22.93%	13.32%	-11.27%	-7.89%	7.05%	7.89%	5.57%
	20% All	-22.93%	13.65%	-11.27%	-7.89%	7.15%	7.96%	5.60%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Risk

Risk	Band	Feb. 19, '20- Mar. 23, '20	Dec. 31, '19- Dec. 31, '20	Sept. 20, '18- Dec. 24, '18	Dec. 29, '17- Dec. 31, '18	Dec. 29, '17- Dec. 31, '20	Dec. 31, '15- Dec. 31, '20	Dec. 31, '10- Dec. 31, '20
Unrebalanced		34.69%	16.04%	9.35%	7.64%	10.95%	9.91%	9.30%
Monthly		36.38%	16.74%	9.49%	7.64%	11.20%	9.52%	8.98%
Quarterly		34.69%	16.38%	9.38%	7.62%	11.03%	9.39%	8.91%
Annual		34.69%	16.04%	9.35%	7.64%	10.89%	9.30%	8.83%
Daily Target	10% Equity	36.66%	17.13%	9.35%	7.64%	11.36%	9.90%	9.06%
	20% All	36.66%	17.27%	9.35%	7.64%	11.49%	9.90%	9.10%
Monthly + Trigger	10% Equity	36.38%	16.74%	9.49%	7.64%	11.20%	9.52%	8.98%
	20% All	36.44%	16.96%	9.49%	7.64%	11.31%	9.59%	9.02%
Quarterly + Trigger	10% Equity	36.66%	17.00%	9.38%	7.62%	11.34%	9.60%	9.02%
	20% All	36.66%	17.00%	9.38%	7.62%	11.34%	9.60%	9.02%
Annual + Trigger	10% Equity	36.66%	17.13%	9.35%	7.64%	11.43%	9.68%	9.04%
	20% All	36.66%	17.27%	9.35%	7.64%	11.50%	9.73%	9.06%

Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Conclusion

While we make the case for why rebalancing is important and why having an intentional strategy is preferred, it is important not to confuse tactical market timing (i.e., random rebalancing, aligned with shifts in asset allocation views) with a sound rebalancing policy. For each of the institutional client

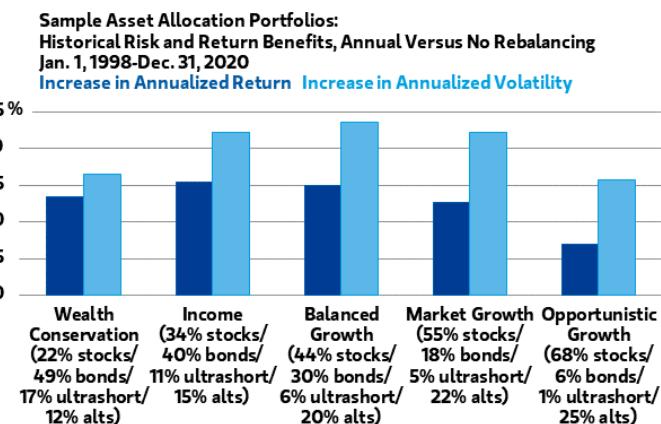
segments, the data show when systematic rebalancing works and how scheduled calendar rebalances compare with rebalancing triggers. With the exception of the Taft-Hartley exercise, which used only US equities rather than a global mix, moving to an annual rebalance across client segments produced the most consistent risk mitigation. ■

Appendix

Review of the GIC Models and 60%/40% Stock/Bond Rebalance

To illustrate some of the potential benefits of rebalancing, we looked at the five GIC multi-asset asset allocation models over time. For simplicity, we applied a scheduled calendar-based approach by rebalancing once a year.

Annual Rebalancing Helped Each of the GIC's Asset Allocation Models



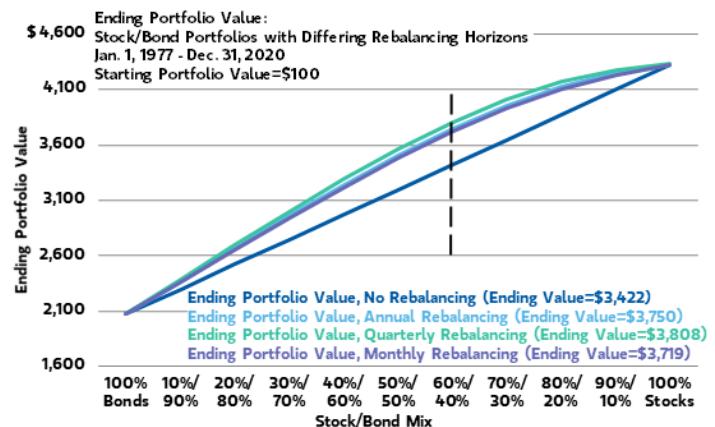
Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

While rebalancing has added value in terms of additional returns, the larger and more impactful contribution to the portfolio has been a reduction in realized volatility. This is especially true for the models that have greater allocations to riskier assets. As a result, the Sharpe ratios of the portfolios greatly improved.

How often to rebalance is a frequent question investors ask themselves. If the portfolio is following a scheduled calendar-based approach, is it better to rebalance monthly, quarterly, or annually? If the portfolio is following a tolerance-band approach, how wide should the bands be set to guide the rebalance? Below, we attempt to help answer those questions.

We started with a simple 60%/40% stock/bond portfolio and simulated four different scheduled calendar-based approaches to rebalancing. In each simulation, rebalancing added value versus not rebalancing. The observations comparing monthly, quarterly, and annual approaches were broadly similar. While the quarterly approach yielded the highest additional return benefit in our simulation, its outperformance is just as likely due to chance as to any a structural and repeatable factor.

How Long-Term Returns May Have Been Improved With Scheduled Rebalancing



Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

To investigate rebalancing strategies using tolerance bands, we started with the same 60%/40% stock/bond portfolio. Given that equity risk dominates a 60%/40% portfolio, we applied threshold triggers only to equity allocations, rebalancing only if they moved by a certain percentage above or below the starting 60%. We ran two simulations: first, if stocks moved above or below the starting 60% in increments from 1% to 7%; second, only rebalancing when stocks moved below the starting 60% in the same increments of 1% to 7%.

The two scenarios resulted in some interesting observations. When compared with an annual rebalance, the decision to rebalance only when equities allocations were below target in every instance of our threshold tolerance, the resulting portfolio return was higher. Results for the scenario where rebalancing occurred if equities were below or above their target threshold trigger were mixed compared to an annual rebalance.

The likely explanation for the divergent observations can be explained by the path that equities took to get to their threshold triggers. There may also be a difference in effective equity allocation across simulations, as continuously adding to stocks when allocations fall but not selling when they rise will result in higher average equity allocations. That could be seen as a move along the efficient frontier, with attendant effects on return and risk. The existence of momentum factors in assets may explain, in part, why rebalancing when stocks are above their target has resulted in mixed returns compared with the other scenarios we ran. It is important to mention, though, that while the momentum factor may be supportive of returns, it does not account for the change in the risk profile of the portfolio. Despite that, our observations clearly suggest to rebalance when risky assets are below their target.

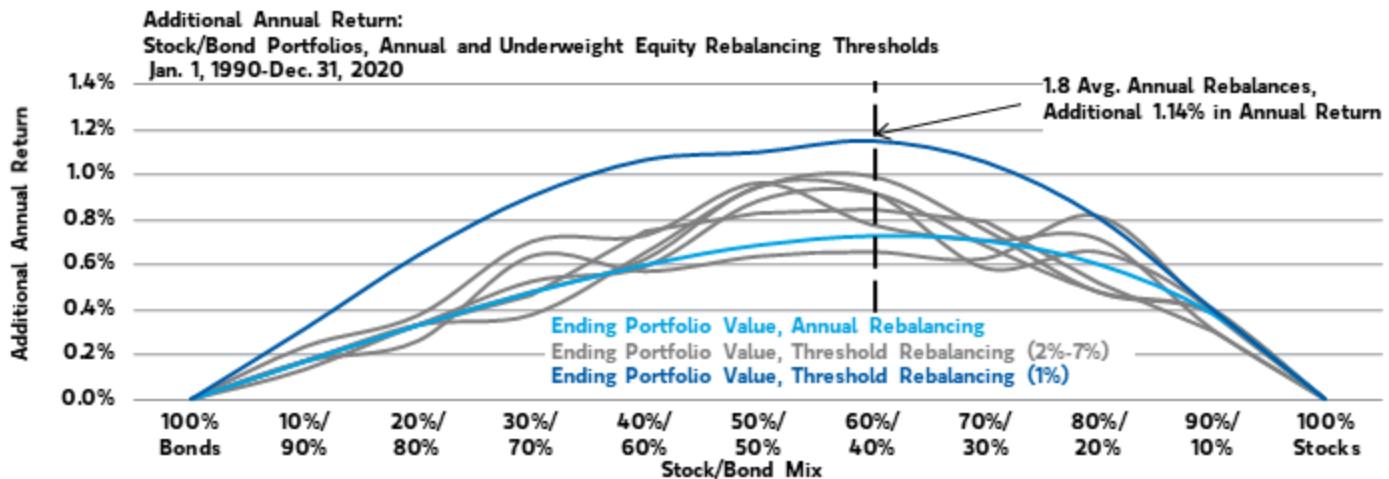
RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

Comparing Different Threshold Rebalancing Scenarios

Thresholds	60%/40% Stock/Bond Portfolio			
	Rebalance When Equities Underweight Only		Rebalance When Equities Overweight or Underweight	
	Number of Rebalances	Extra Annual Return	Number of Rebalances	Extra Annual Return
1%	1.77	1.15%	3.42	0.39%
2%	1.42	0.78%	2.03	0.26%
3%	1.32	0.92%	1.55	0.48%
4%	1.16	0.85%	1.29	0.61%
5%	1.13	0.66%	1.16	0.61%
6%	1.10	0.92%	1.13	0.92%
7%	1.10	0.99%	1.10	0.99%
Annual Rebalance Only	1.00	0.73%	1.00	0.73%

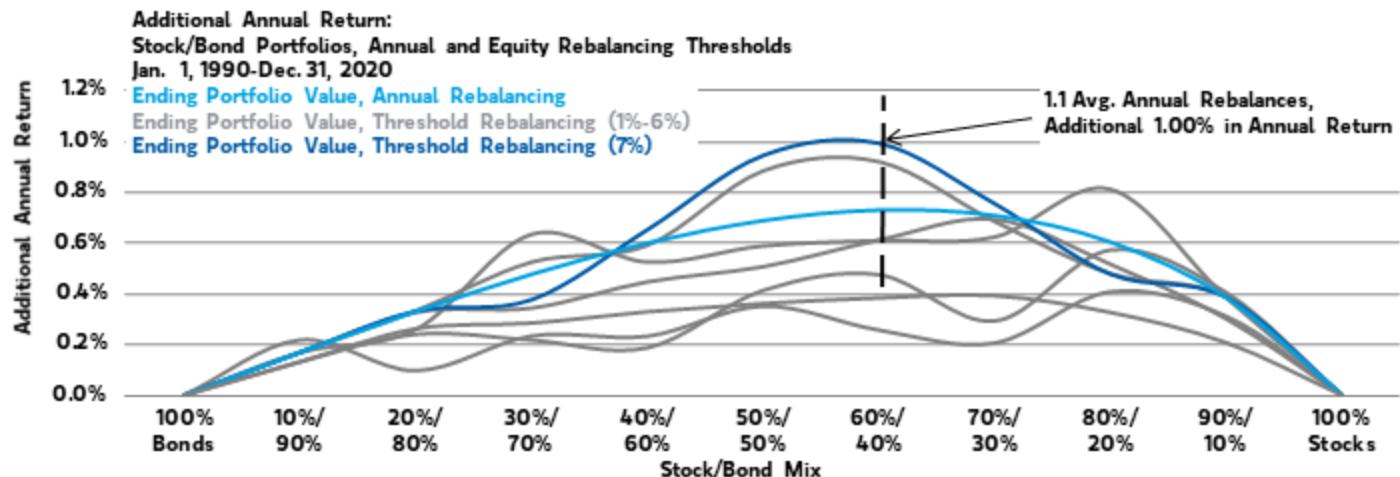
Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Underweight Only Threshold Rebalancing Added More Than Annual Rebalancing



Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Threshold Rebalancing Added More Than Annual Rebalancing



Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

Disclosure Section

For index definitions referenced in this report please visit the following: <https://www.morganstanley.com/wealth-investmentsolutions/wmir-definitions>

Glossary

Excess return represents the average quarterly total return of the portfolio relative to its benchmark. A portfolio with a positive excess return has on average outperformed its benchmark on a quarterly basis. This statistic is obtained by subtracting the benchmark return from the portfolio's return.

Information Ratio (IR) is a ratio of portfolio returns above the returns of a benchmark—usually an index—to the volatility of those returns.

Sharpe Ratio This statistic measures a portfolio's rate of return based on the risk it assumed and is often referred to as its risk-adjusted performance. Using standard deviation and returns in excess of the returns of T-bills, it determines reward per unit of risk. This measurement can help determine if the portfolio is reaching its goal of increasing returns while managing risk.

Tracking error is a divergence between the price behavior of a position or a portfolio and the price behavior of a benchmark.

Volatility This is a statistical measure of the dispersion of returns for a given security or market index. Volatility can either be measured by using the standard deviation or variance between returns from that same security or market index. Commonly, the higher the volatility, the riskier the security.

Risk Considerations

Investing in the market entails the risk of market volatility. The value of all types of securities may increase or decrease over varying time periods.

This analysis does not purport to recommend or implement an investment strategy. Financial forecasts, rates of return, risk, inflation, and other assumptions may be used as the basis for illustrations in this analysis. They should not be considered a guarantee of future performance, or a guarantee of achieving overall financial objectives. No analysis has the ability to accurately predict the future, eliminate risk, or guarantee investment results. As investment returns, inflation, taxes, and other economic conditions vary from the assumptions used in this analysis, your actual results will vary (perhaps significantly) from those presented in this analysis.

Rebalancing does not protect against a loss in declining financial markets. There may be a potential tax implication with a rebalancing strategy. Investors should consult with their tax advisor before implementing such a strategy.

Investing in foreign markets entails greater risks than those normally associated with domestic markets, such as political, currency, economic and market risks. These risks are magnified in countries with **emerging markets and frontier markets**, since these countries may have relatively unstable governments and less established markets and economies.

Bonds are subject to interest rate risk. When interest rates rise, bond prices fall; generally the longer a bond's maturity, the more sensitive it is to this risk. Bonds may also be subject to call risk, which is the risk that the issuer will redeem the debt at its option, fully or partially, before the scheduled maturity date. The market value of debt instruments may fluctuate, and proceeds from sales prior to maturity may be more or less than the amount originally invested or the maturity value due to changes in market conditions or changes in the credit quality of the issuer. Bonds are subject to the credit risk of the issuer. This is the risk that the issuer might be unable to make interest and/or principal payments on a timely basis. Bonds are also subject to reinvestment risk, which is the risk that principal and/or interest payments from a given investment may be reinvested at a lower interest rate.

Bonds rated below investment grade may have speculative characteristics and present significant risks beyond those of other securities, including greater credit risk and price volatility in the secondary market. Investors should be careful to consider these risks alongside their individual circumstances, objectives and risk tolerance before investing in high-yield bonds. High yield bonds should comprise only a limited portion of a balanced portfolio.

Ultrashort-term fixed income asset class is comprised of fixed income securities with high quality, very short maturities. They are therefore subject to the risks associated with debt securities such as credit and interest rate risk.

Yields are subject to change with economic conditions. Yield is only one factor that should be considered when making an investment decision.

Equity securities may fluctuate in response to news on companies, industries, market conditions and general economic environment.

Alternative investments may be either traditional alternative investment vehicles, such as hedge funds, fund of hedge funds, private equity, private real estate and managed futures or, non-traditional products such as mutual funds and exchange-traded funds that also seek alternative-like exposure but have significant differences from traditional alternative investments. Alternative investments often are speculative and include a high degree of risk. Investors could lose all or a substantial amount of their investment. Alternative investments are appropriate only for eligible, long-term investors who are willing to forgo liquidity and put capital at risk for an indefinite period of time. They may be highly illiquid and can engage in leverage and other speculative practices that may increase the volatility and risk of loss. Alternative Investments typically have higher fees than traditional investments. Investors should carefully review and consider potential risks before investing. Certain of these risks may include but are not limited to: Loss of all or a substantial portion of the investment due to leveraging, short-selling, or other speculative practices; Lack of liquidity in that there may be no secondary market for a fund; Volatility of returns; Restrictions on transferring interests in a fund; Potential lack of diversification and resulting higher risk due to concentration of trading authority when a single advisor is utilized; Absence of information regarding valuations and pricing; Complex tax structures and delays in tax reporting; Less regulation and higher

RESOLVING THE REBALANCING RIDDLE FOR INSTITUTIONAL CLIENTS

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Stocks of medium-sized companies entail special risks, such as limited product lines, markets, and financial resources, and greater market volatility than securities of larger, more-established companies.

Value investing does not guarantee a profit or eliminate risk. Not all companies whose stocks are considered to be value stocks are able to turn their business around or successfully employ corrective strategies which would result in stock prices that do not rise as initially expected.

Growth investing does not guarantee a profit or eliminate risk. The stocks of these companies can have relatively high valuations. Because of these high valuations, an investment in a growth stock can be more risky than an investment in a company with more modest growth expectations.

Asset allocation and diversification do not assure a profit or protect against loss in declining financial markets.

Because of their narrow focus, **sector investments** tend to be more volatile than investments that diversify across many sectors and companies. **Technology stocks** may be especially volatile. Risks applicable to companies in the **energy and natural resources** sectors include commodity pricing risk, supply and demand risk, depletion risk and exploration risk.

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