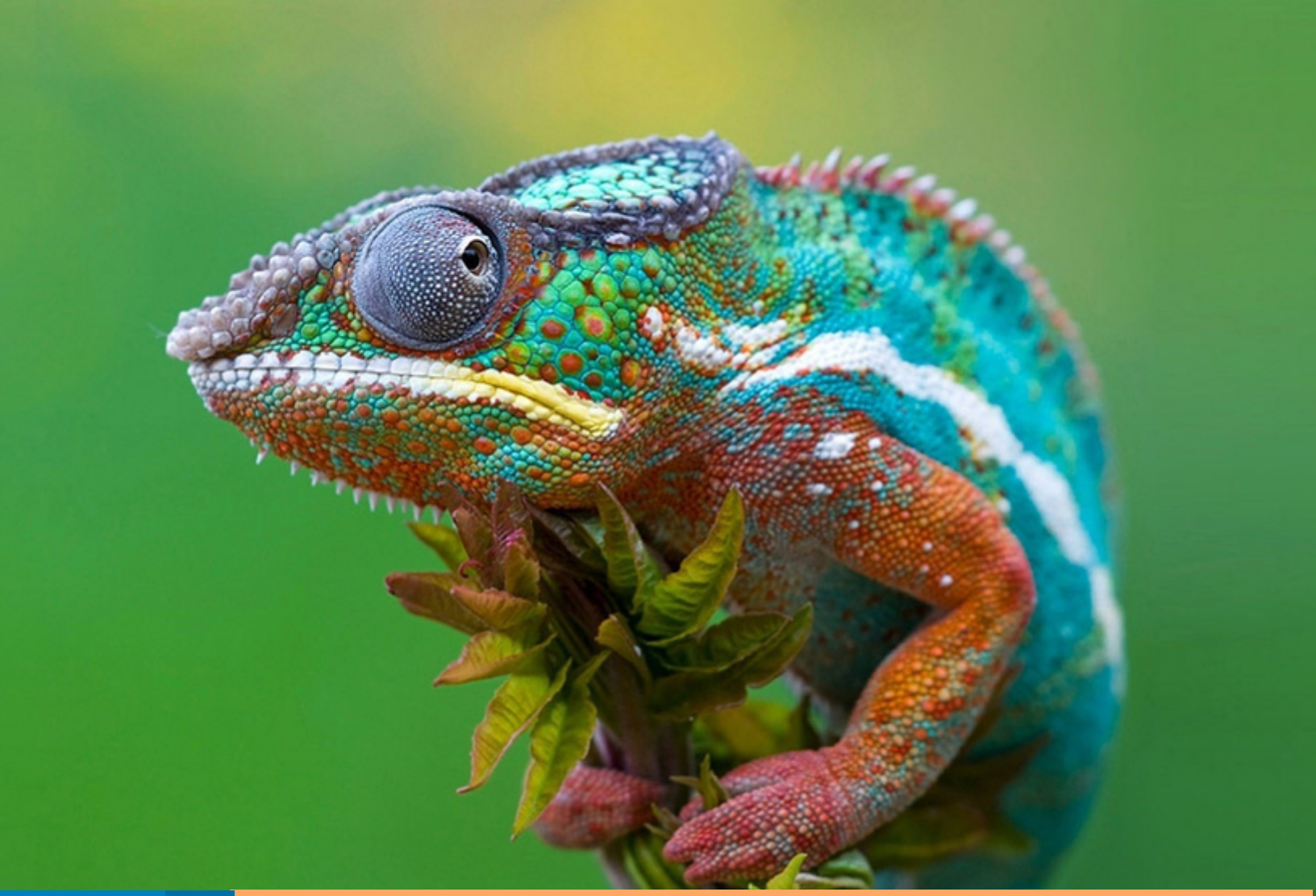


Adaptive Asset Allocation
GLOBAL RISK PARITY
WITH MACRO FACTORS

ReSolve
ASSET MANAGEMENT

FACING DOWN A LOW RETURN ENVIRONMENT

By most measures U.S. stocks and global bonds have pushed well into high valuation territory, which has preceded periods of very low prospective returns in the past. For investors to achieve the same results as they achieved over the past 10 years in the next decade, we will have to experience a third major bubble in a row.

As a result, we believe that investors with material quasi-passive allocations to U.S. equities and global fixed income are going to be disappointed with their returns over the next decade or so. We aren't alone with this view; there is broad consensus across many credible sources, including AQR, Research Affiliates, and others, that traditional portfolios may produce insufficient returns.

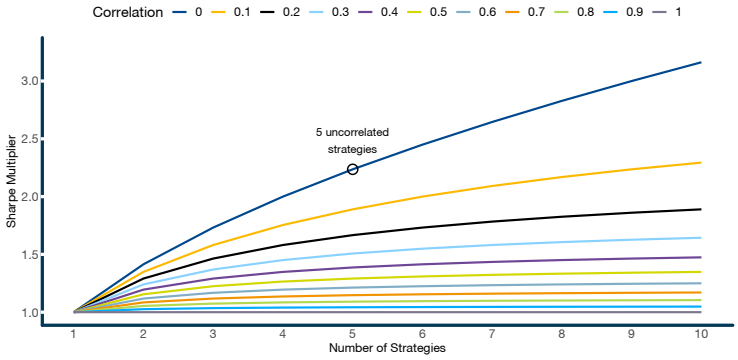
To address these shortcomings, we advocate a portfolio framework that emphasizes global scope while maximizing diversification across asset classes, macro factors and alternative premia. This solution offers a greater likelihood of producing the returns investors need, with less risk than they would be taking with a traditional approach. We designed the Adaptive Asset Allocation concept to deliver on this vision.

DIVERSIFICATION IN FOCUS

While many strategies pay lip-service to diversification by owning a large number of individual stocks and/or bonds, this approach falls well short of diversification's true potential. Students of portfolio theory understand that the secret to strong, stable investment returns is to allocate to many investment strategies that derive returns from different sources at different times.

Figure 1 illustrates how risk-adjusted portfolio returns can be amplified by adding new strategies, especially when strategies are lowly correlated. For example, an investor with five uncorrelated sources of return may expect to produce 2.24x the returns of an investor with just one strategy at the same level of risk (see plot annotation).

Figure 1: Sharpe ratio multiplication factor given number of different investment strategies with specified average pairwise correlations



Source: ReSolve Asset Management. For illustrative purposes only.

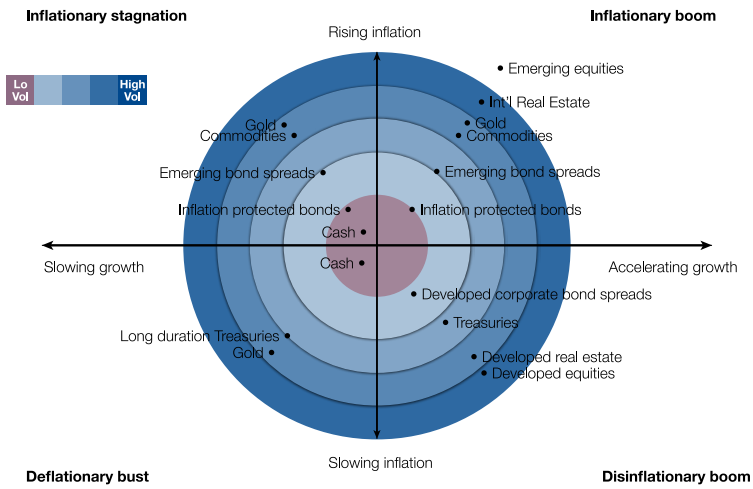
Our approach starts with a comprehensive focus on diversification, which requires a thoughtful combination of both diversity and balance. A diverse universe of investments will have assets that are designed to thrive under all major economic environments, not just those that are favorable to stocks.

That means we need to complement the investments that are typically found in portfolios with assets like commodities and gold; global government bonds; inflation protected securities like TIPS; and, emerging market securities. Of course, some of these diverse asset classes are much more volatile than others, so we need to consider the most effective way of bringing them together in a portfolio.

The objective should be to ensure that each major asset class has an equal ability to express its unique character, so that the portfolio can maximize the chances of being resilient to any economic future.

Figure 2 presents a simple framework for thinking about macroeconomic diversification. Asset classes listed in each quadrant respond most favorably to their respective growth and inflation dynamics, and assets further from the center are expected to exhibit a higher beta to the regime.

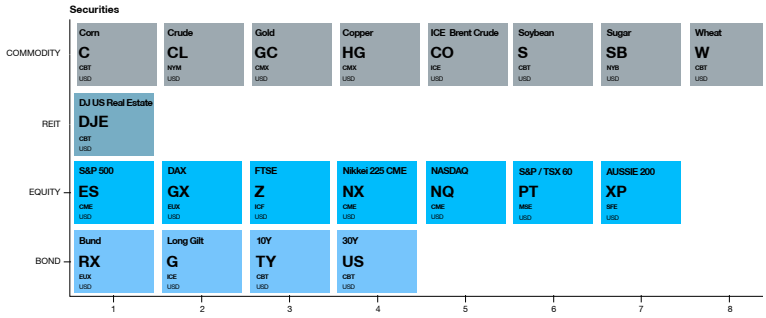
Figure 2: Global asset classes assigned to favourable growth and inflation regimes. Asset classes further from the center have a higher beta to the regime.



Source: ReSolve Asset Management. For illustrative purposes only.

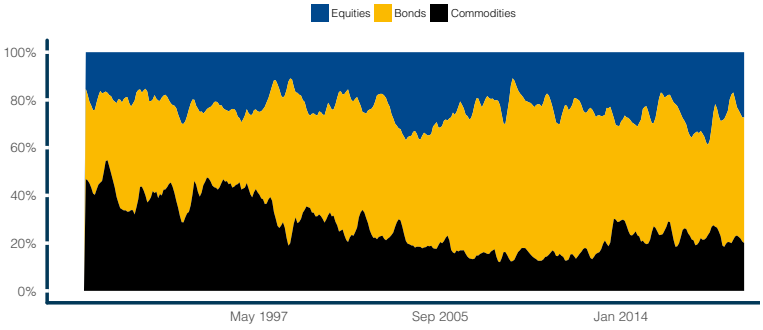
A simple risk parity portfolio sets the weights so that every market contributes the same risk to the portfolio. We created a simple Risk Parity simulation[1] to target 12% volatility from a diverse universe of futures markets that respond differently to the spectrum of these economic regimes, as detailed in Figure 3.

Figure 3: Risk Parity Universe Of Futures markets



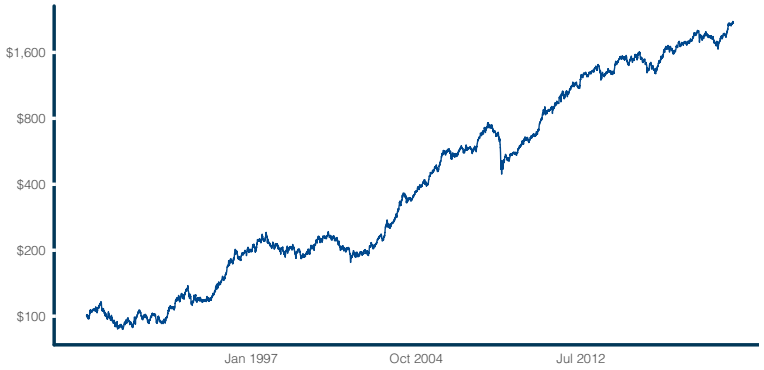
Source: ReSolve Asset Management. For illustrative purposes only.

Figure 4: Monthly asset allocation of Risk Parity simulation, 1991 - 2019. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.



Source: ReSolve Asset Management. Data from CSI. SIMULATED RESULTS. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. All returns and metrics are in excess of the risk-free rate. For illustrative purposes only.

Figure 5: Wealth trajectory of excess returns for Risk Parity simulation, 1991 - 2019. SIMULATED RESULTS. This simulation is for illustrative purposes only and is not based on an actual portfolio ReSolve manages. Please review disclaimers at the end of this document for more information.



Source: ReSolve Asset Management. Data from CSI. SIMULATED RESULTS. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. All returns and metrics are in excess of the risk-free rate. For illustrative purposes only.

Table 1: Performance: Risk Parity simulation. SIMULATED RESULTS. This simulation is for illustrative purposes only and is not based on an actual portfolio ReSolve manages. Please review disclaimers at the end of this document for more information.

Risk Parity simulation	
Annualized Excess Return	10.38%
Sharpe Ratio	0.82
Annualized Volatility	13.10%
Max Drawdown	-41.80%
Percent Positive Years	73.30%
Growth of $100	2,165.18

Source: ReSolve Asset Management. Data from CSI. SIMULATED RESULTS. This simulation is for illustrative purposes only and is not based on an actual portfolio ReSolve manages. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. All returns and metrics are in excess of the risk-free rate. For illustrative purposes only.

[1] To create the simulation, we formed portfolios quarterly (in three monthly tranches) with weights found using the equal risk contribution algorithm, based on an exponentially weighted covariance matrix estimated on daily data with a lambda value of 0.97. Finally, we scaled the strategy at each rebalance date to target 12% volatility based on the same covariance estimates.

EXPANDING THE FRONTIER

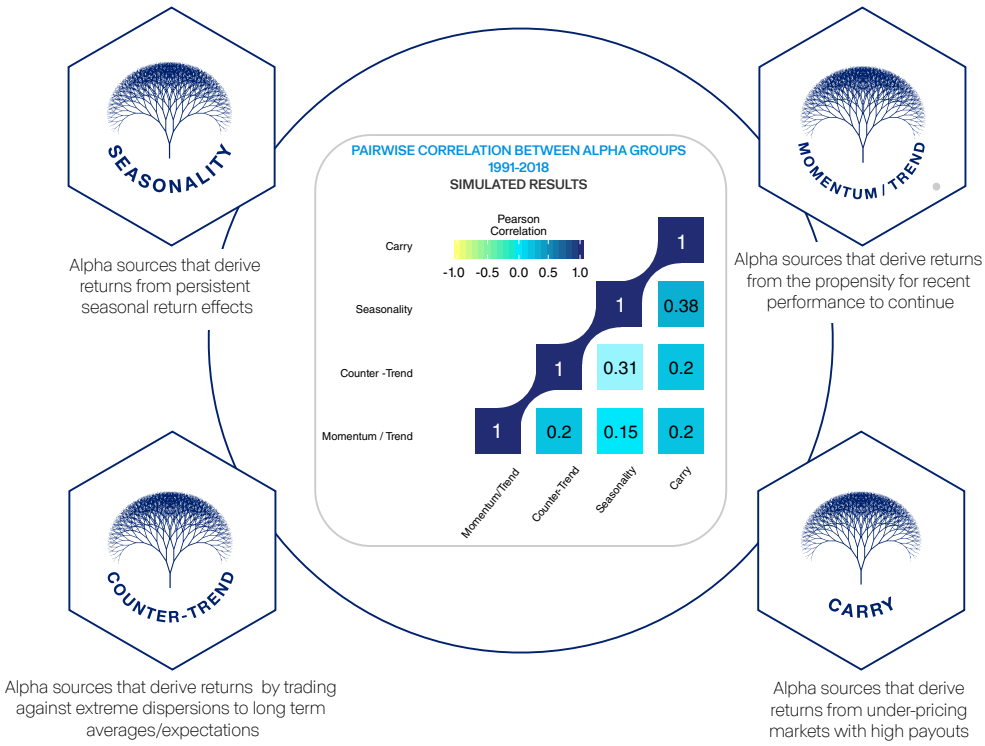
As we have shown in our seminal paper on the concept of Adaptive Asset Allocation in the past, the concept of diversification can extend to other sources of return that behave differently from the major asset classes themselves. These returns derive from structural and/or behavioural inefficiencies that can be exploited by profit-seeking investors.

Investors are often slow to adapt to new information, and are prone to extrapolate intermediate-term trends, while underestimating the tendency of corporate or economic prospects to revert to the mean. Many investors also express a preference for "lottery ticket"-type investments; eschew leverage; prefer investments with positive skew; avoid taking short positions; and chase performance at precisely the wrong horizon. They also overpay for insurance against large short-term losses.

Other systematic profit opportunities arise due to structural factors or the actions of global institutions that may pursue non-wealth-maximizing objectives to achieve political or longer-term policy goals.

These inefficiencies leave a variety of profit opportunities for skilled, unconstrained investors to exploit. They manifest as "style premia", "factors" or "edges" that produce returns derived from different sources at different times. In other words, they add to our bench of uncorrelated strategies in pursuit of the most efficient portfolio.

Figure 6: ReSolve Global Macro Alpha Stack employed in ReSolve strategies



Source: ReSolve Asset Management. For illustrative purposes only.

ReSolve research focuses on so-called "multi-asset" profit opportunities that manifest across global stock and bond indexes, commodities and currencies. Multi-asset anomalies arise from the same forces as securities-based anomalies, but often have larger barriers to arbitrage.

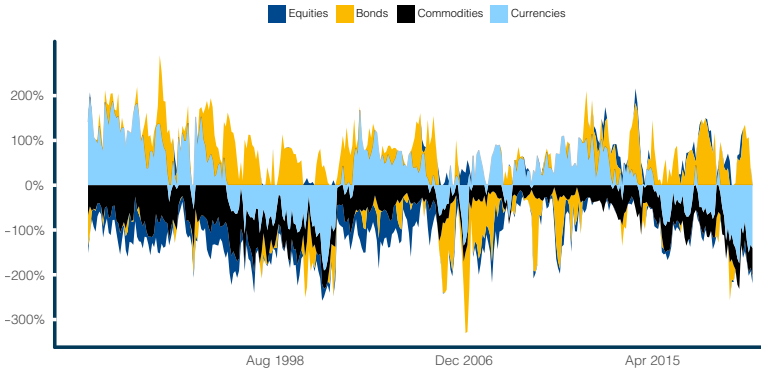
At the multi-asset level, the asset allocation is set by a policy committee, and guided by long-term capital market expectations. Institutions rarely take on material active risk at this level of the portfolio. Some institutions are bound by rigid actuarial rules and can only tolerate very small deviations from policy weights. Committee level decisions are typically slow, incremental, and reactive. And peer-oriented compensation schemes heavily and asymmetrically penalize short-term tracking-error relative to long-term alpha generation. These are large and persistent barriers to arbitrage that suggest multi-asset anomalies may exhibit a long shelf-life.

A plain-vanilla risk parity portfolio produces the highest return per unit of risk (i.e. is mean-variance optimal) when markets are expected to produce excess return in proportion to their risk. While this may be a good place to start, global macro market inefficiencies provide opportunities to enhance a risk parity strategy by taking active positions informed by systematic macro anomalies.

For this implementation of Adaptive Asset Allocation we can employ this "Alpha Stack" of strategies including Trend-Following, Counter-Trend, Carry and Seasonality as described in Figure 6 to tilt strategies in favour of markets with more positive relative prospects while preserving the optimal risk balance through advanced optimization. These strategies have combined to produce highly attractive alpha relative to a plain-vanilla risk parity strategy.

Figure 6 above describes the active differences in asset allocation relative to the Risk Parity simulation through time that are informed by our Alpha Stack. The Adaptive Asset Allocation concept with Macro Factors shown here also includes currencies, which respond to our Alpha Stack and also provide important diversification benefits. The strategy is managed to a 12% volatility target. It's clear that, while the methodology's neutral position is global risk parity, it deviates meaningfully and dynamically in pursuit of excess returns.

Figure 7: Historical active difference in monthly asset allocation between Adaptive Asset Allocation with Macro Factors and simple Risk Parity simulation. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.



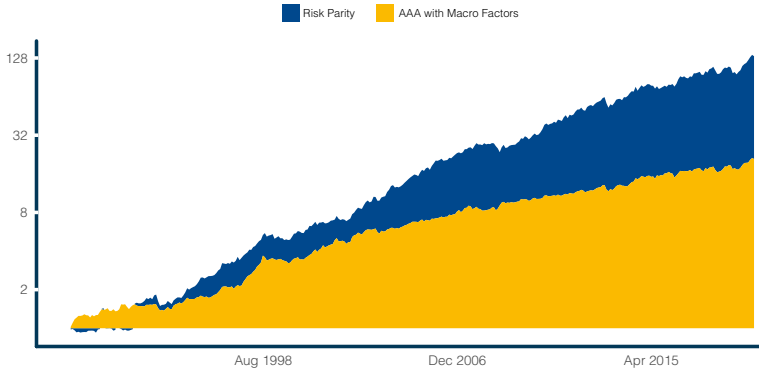
Source: ReSolve Asset Management. Data from CSI and Bloomberg. SIMULATED RESULTS. This simulation is for illustrative purposes only and is not based on an actual portfolio ReSolve manages. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. For illustrative purposes only.

In simulation, the Adaptive Asset Allocation with Macro Factors methodology at a 12% volatility target derived 40 percent of its returns since 1991 from strategic exposure to the simple Risk Parity simulation described above. The balance of its returns has been produced through exposure to the strategies in our Alpha Stack.

The Alpha Stack produced 10.6 percent per year in annualized alpha (t-value of 6.2) relative to the Risk Parity simulation. This translates into 1,988 percent of total cumulative alpha since inception.

Figure 8 decomposes the cumulative gains from Adaptive Asset Allocation into gains from exposure to risk parity and gains from the Alpha Stack.

Figure 8: Cumulative alpha of Adaptive Asset Allocation with Macro Factors relative to Risk Parity simulation, 1991 - 2019. SIMULATED RESULT. Please review disclaimers at the end of this document for more information.



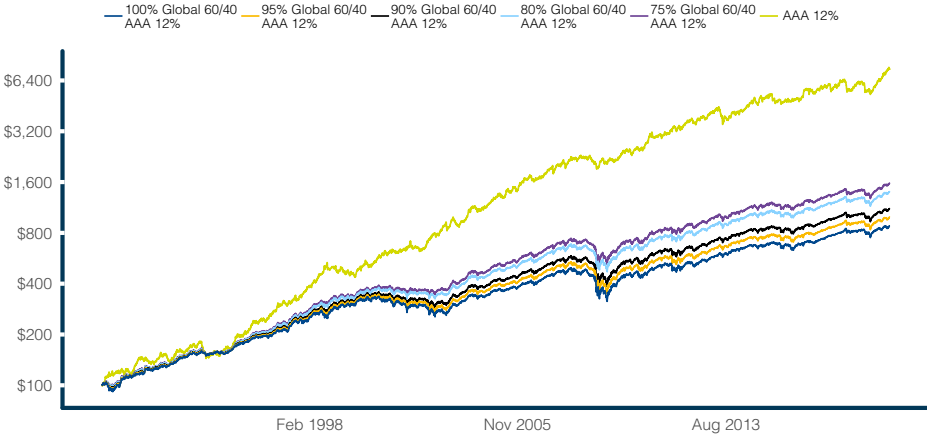
Source: ReSolve Asset Management. Data from CSI and Bloomberg. SIMULATED RESULTS. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. For illustrative purposes only.

ADAPTIVE ASSET ALLOCATION WITH MACRO FACTORS IN A PORTFOLIO

Traditional balanced portfolios may achieve higher returns per unit of risk with a modest allocation like Adaptive Asset Allocation. Our benchmark is a 60/40 portfolio consisting of Vanguard and DFA index funds in a mix of 30% domestic stocks (VFINX), 30% international stocks (DFALX) and 40% core domestic bonds (VBMFX).

The benchmark is net of actual fees and trading costs so we have conservatively discounted the Adaptive Asset Allocation futures simulation to be net of expected commissions, market impact costs, and fees of 1.85% per year. Since futures returns are net of borrowing costs, we've also added back the return that would have been earned on cash and margin in the futures account, assuming 75% of T-bill rates.

Figure 9: Compound wealth of Global 60/40 with Adaptive Asset Allocation at 12% volatility target with Macro Factors (Net of fees and estimated transaction costs), 1991 - 2019. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.



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Source: ReSolve Asset Management. Data from CSI and Bloomberg. PAST RESULTS ARE NOT INDICATIVE OF FUTURE PERFORMANCE. This simulation is for illustrative purposes only and is not based on an actual portfolio ReSolve manages. It is expected that the simulated performance will periodically change as a function of both refinements to our simulation methodology and the underlying market data.

Figure 10: Calendar year returns for Global 60/40 and Adaptive Asset Allocation at 12% volatility target (Gross of fees and transaction costs), 1991 - Q1 2020. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.

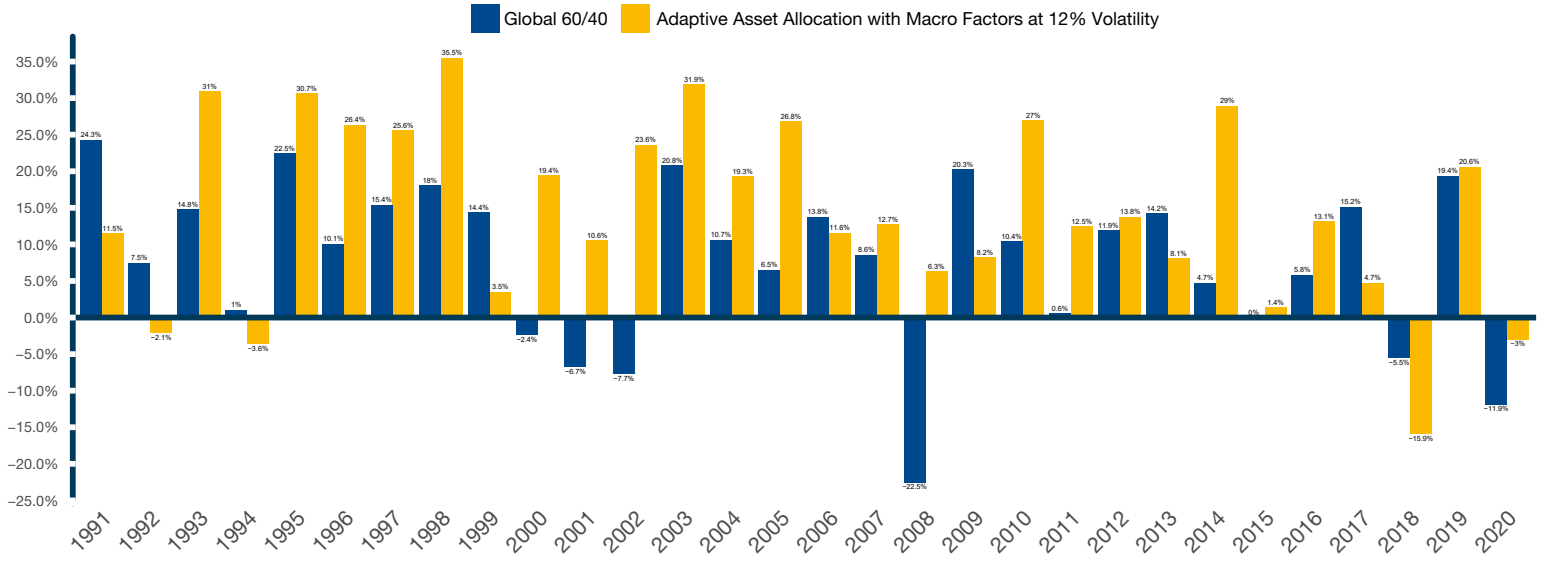

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Table 2: Performance: Global 60/40 with Adaptive Asset Allocation with Macro Factors (Net of fees and estimated transaction costs), 1991 - 2019. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.

	100% Global 60/40 0% AAA 12% Volatility	95% Global 60/40 5% AAA 12% Volatility	90% Global 60/40 10% AAA 12% Volatility	80% Global 60/40 20% AAA 12% Volatility	75% Global 60/40 25% AAA 12% Volatility	0% Global 60/40 100% AAA 12% Volatility
Annualized Return	7.50%	7.92%	8.34%	9.17%	9.58%	15.40%
Volatility	9.40%	9.20%	9.00%	8.70%	8.60%	12.10%
Sharpe Ratio	0.60	0.66	0.71	0.82	0.88	1.08
Max Drawdown	-36.70%	-35.40%	-34.10%	-31.50%	-30.20%	-21.30%
Return to Ulcer Ratio	1.07	1.22	1.39	1.73	1.92	2.48
Percent Positive Years	83.40%	83.90%	84.50%	85.20%	86.40%	85.50%
Growth of $100	879.29	989.30	1,111.74	1,398.98	1,566.54	7,410.78

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It's clear that even a modest allocation to an Adaptive Asset Allocation implementation such as the one described here may add materially to investors' bottom line while reducing the depth and duration of losses along the way. Returns increase steadily as a function of the allocation to the strategy while we observe a commensurate reduction in volatility and drawdowns. The Ulcer Ratio captures both the depth and duration of drawdowns and is a robust measure of cumulative investor misery. Just a 25% allocation to Adaptive Asset Allocation produces an almost 80% improvement in returns per unit of investor misery.

From the perspective of so-called "rational utility", the portfolio that maximizes expected return per unit of volatility would hold 34% in the global 60/40 portfolio and 66% in the Adaptive Asset Allocation 12% Volatility Target implementation.

Of course, investors are not just sensitive to growth and loss. They are also sensitive to growth and loss relative to their benchmark portfolio. Tracking error is an incomplete but useful approximation of this perceived risk. The portfolio that provides an optimal balance between maximizing the Sharpe ratio at minimal cost in terms of tracking error would hold 47% in the Strategy and 53% in the global 60/40 portfolio.

SUMMARY

The traditional Risk Parity framework, premised on global scope, macro-economic diversity and risk balance, represents a substantial leap forward in thinking about portfolio construction. However, it may be naive to think that markets are always priced for risk-efficiency given the substantial barriers to arbitrage that exist at a macro scale.

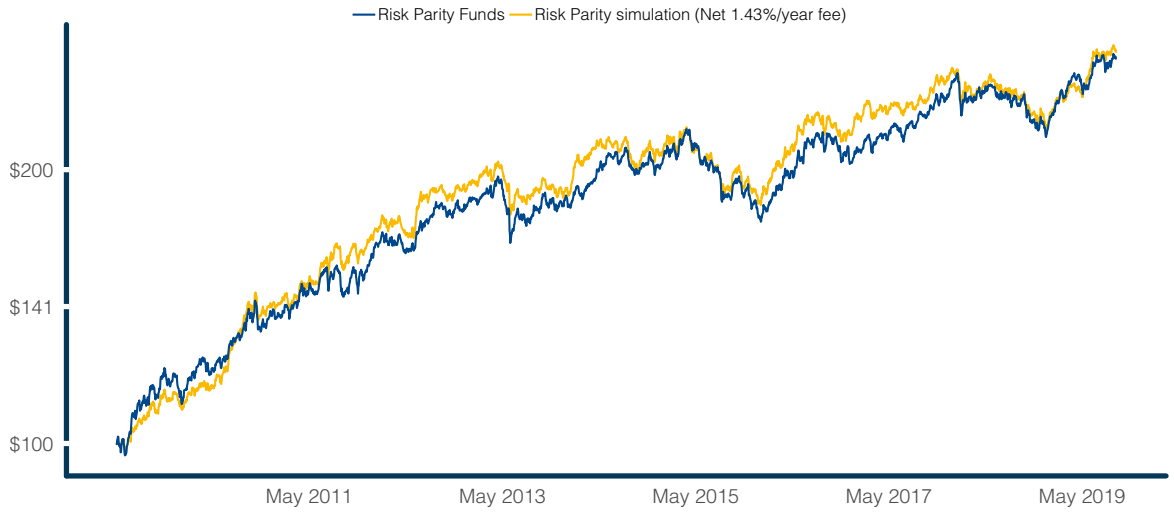
The Adaptive Asset Allocation concept can be applied in many ways. In this implementation we can see the benefits of marrying the principles of risk parity with active views from economically significant macro-anomalies to produce a compelling strategy that acts as a strong complement to most portfolios. A 25% allocation has the potential **to increase expected risk-adjusted performance of a Global 60/40 portfolio by almost 50%** net of fees and transaction costs.

APPENDIX - RISK PARITY SIMULATION VS POPULAR RISK PARITY FUNDS

While our Risk Parity simulation is clearly a basic implementation of the concept, we feel it is representative of popular commercially available risk parity strategies. For example, our simulation has a Pearson correlation of 0.85 with an equally weighted composite of Invesco Balanced Risk (ABRRX) and AQR Multi-Asset (AQRIX) funds since inception in 2009.

Figure 11 shows that the performance of our simulation tracks the performance of the risk parity fund composite extremely closely. The alpha intercept of a regression of the fund composite on our Risk Parity simulation is statistically indistinguishable from zero. As such, we are persuaded that a long-term analysis of a Adaptive Asset Allocation methodology against our Risk Parity simulation benchmark should allow for relevant comparisons vis-a-vis existing Risk Parity products currently available to investors.

Figure 11: Wealth trajectory of excess returns for Risk Parity simulation vs. equal weighted composite of Invesco Balanced Risk and AQR Multi-Asset funds since inception. SIMULATED RESULTS. Please review disclaimers at the end of this document for more information.



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